Driving Bangalore Ahead

BANGALORE METRO RAIL CORPORATION LIMITED

TENDER DOCUMENT

FOR

Manufacturing, Supply and Laying of Cable Trough for Reach-3 Extension and Reach-6 (New Line) of Phase-II

TENDER NO. BMRCL/2023-24/OW/WORK_INDENT5

VOLUME 1

QUALIFICATION CUM TECHNICAL PACKAGE

November 2023

BANGALORE METRO RAIL CORPORATION LIMITED
III Floor, BMTC Complex, K H Road, Shanthinagar
Bangalore – 560 027 Karnataka
India

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KEY DETAILS

Tender No: BMRCL/2023-24/OW/WORK_INDENT5		
Name of Work: Manufacturing, Supply and Laying of Cable Trough for Reach-3 Extension and Reach-6 (New Line) of Phase-II		
Sl.no.	**Description**	
1.	Estimated Value of work	INR **6,34,07,647**/- (**Indian Rupees Six Crores Thirty Four Lakh Seven Thousand Six Hundred and Forty Seven Only**)
2.	Earnest Money Deposit Tender Security	Rs. 9,51,115/- (Rupees Nine Lakh Fifty One Thousand One Hundred and Fifteen Only). The tenderer shall pay full EMD (Tender Security) amount: In the form of a Bank Guarantee (BG)/e-BG in favour of 'Bangalore Metro Rail Corporation Limited'.
3.	Completion period of Works	08 Months
4.	Download of Tender Documents	Tender documents to be downloaded from Karnataka Public Procurement Portal (https://kppp.karnataka.gov.in/) from 27/11/2023
5.	Last Date of Seeking Clarification	As per Date and Time specified in e-Procurement Portal.
6.	Date and Time of Pre-Bid Meeting	As per Date and Time specified in e-Procurement Portal.
7.	Date and Time of submission of Tender	As per Date and Time specified in e-Procurement Portal.
8.	Date and Time of opening of Tender (Qualification Cum Technical Package)	As per Date and Time specified in e-Procurement Portal.
9.	Date and Time of opening of Tender (Financial Package)	Will be intimated to the Qualified Tenderers through e-Procurement Portal. Tenderers to trace the same.
10.	Place of Opening of Tender (Qualification Cum Technical Package & Financial Package)	The opening of the Qualification Cum Technical Package shall take place at e-Procurement Portal (https://kppp.karnataka.gov.in/).
11.	Address for communication	Executive Director (TRACTION) Bangalore Metro Rail Corporation Ltd., Bangalore, PIN-560027 Karnataka, India. Ph. No:080-22969300 Fax No: 080-22969222 Email: bmrcl@dataone.in

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SECTION 1: NOTICE INVITING TENDER (NIT)

NIT No.: BMRCL/2023-24/OW/WORK_INDENT5 Date: XX/XX/XXXX

1. Bangalore Metro Rail Corporation Ltd (BMRCL) invites Tenders (Single stage - Two envelope system) from eligible Domestic Tenderers, having similar works experience completed in any Central Govt / State Govt / PSU's / Govt bodies / MES/ Railway / CPWD / KPWD / BMRCL / Public Limited Companies/ Private Limited Companies for the works through Karnataka Public Procurement Portal (e-Procurement Portal). This tender is a 'PERCENTAGE TENDER'

TABLE

Tender No.	Name of work	Estimated value of work (Rs.)	Earnest Money Deposit / Tender Security (Rs.)	Period of completion
1	2	3	5	6
BMRCL/2023-24/OW/WORK_INDENT5	**Manufacturing, Supply and Laying of Cable Trough for Reach-3 Extension and Reach-6 (New Line) of Phase-II**	**6,34,07,647.00**	**9,51,115.00**	**08 Months**

2. **REGISTRATION**:

a) Tenders required to enroll on the Karnataka Public Procurement Portal (https://kppp.karnataka.gov.in/) by clicking on the link "Tenderers Registration" on the Karnataka Public Procurement Portal by paying requisite registration fee.

b) As part of the enrolment process, the Tenderers will be required to choose a unique user name to assign a password for their accounts.

c) Tenderers are advised to register their valid email addresses and mobile numbers as part of the registration process. These would be used for any communication with the Tenderer.

d) Upon enrolment, the Tenderers will be required to register their valid Digital Signature Certificate (Only Class III Certificates with signing + encryption key usage) issued by any Certifying Authority recognized by CCA India.

e) Only one valid DSC should be registered by a Tenderer. Please note that the Tenderers are responsible to ensure that they do not lend their DSCs to others which may lead to misuse.

f) Tenderers then login to the website through the secured log-in by entering their user ID/password and the password of the DSC / e-Token.

g) The scanned copies of all original documents (as required) should be uploaded on portal in PDF/JPG format.

h) For any query regarding e-procurement on the Karnataka Public Procurement Portal, contact helpdesk number: +91-8046010000, +91-8068948777, support@eprochelpdesk.com.

3. **SEARCHING FOR TENDERS/BIDS:**

Once the Tenderers have selected the proposal bids/tenders and if they are interested to participate, the Tenderers can pay non-refundable processing fee to Karnataka Public Procurement Portal.

However, the tenderer shall submit such transaction details along with their tender submission on e-portal. If the same transaction reference number has been submitted for more than one bid, all such bids shall be considered ineligible and summarily rejected.

It will be the responsibility of the Tenderer to check the website and see any Addendum/Corrigendum issued in this tender from time to time and ensure submission of Tender submittals binding accordingly.

4. Tender documents consist of the following Volumes/Parts/Sections,

Volume — 1: Qualification Cum Technical Package

- SECTION 1 - Notice Inviting Tenders(NIT)
- SECTION 2 - Instructions to Tenderers(ITT)
- SECTION 3 - Qualification Information
- SECTION 4 - Form of Tender (FOT)
- SECTION 5 - General Conditions of Contract (GCC)
- SECTION 6 - Special Conditions of Contract (SCC)
- SECTION 7 - Technical Specifications
- SECTION 8 - Drawing
- SECTION 9 - Proforma of Bank Gaurantees
- SECTION 10 - Annexures
- SECTION 11 - SHE Manual

Volume - 2: Financial Package

- Bill of Quantities

5. Tenderer's submittals must be accompanied by a EMD/Tender Security for an amount as mentioned in the 'Key Details of Tender', in the requisite form as described in ITT clause 14. The EMD shall be valid for a period of 45 days beyond the validity of Tender (i.e. 120+45 = 165)

6. Tenders must be submitted electronically through Karnataka Public Procurement Portal /eProcurement Portal (https://kppp.karnataka.gov.in/) before the last date & time Prescribed in the e-Procurement portal using a valid DSC (Digital signed certificate).

All Tenderers are requested to note that the original of those documents in hardcopy as listed under ITT clause 9.2 should be submitted by 'Speed post' or 'in person' at BMRCL office within 5 days from last date of Tender submission. Tender submission without such submission of original documents shall be liable for rejection.

7. 'Qualification cum Technical Package' will be opened as per the latest specified time and date published in the e-Procurement portal.

The Financial Packages of technically qualified Tenderers will be opened at a date and time advised by BMRCL through e-Procurement Portal.

8. The Tenderer shall provide credentials in support of their eligibility, qualifying criteria, technical capability, financial strength/support and past work experience by supporting documents / client certificates / CA's audit reports set forth in ITT Clause 3.

9. Tenders shall be valid for a period of 120 days from the last date for submission of Tenders.

10. Tenders cannot be submitted online after stipulated time of submission of Tender.

11. BMRCL requires that Tenderers and Contractors observe highest standard of ethics during the procurement and execution of Contract. In pursuance of this policy, the Employer;

    a. Will reject the Tender for the Work or rescind the Contract, if BMRCL determines that the Tenderer / Contractor have engaged in Corrupt or Fraudulent practices, at any stage.

    b. will declare a Contractor ineligible, either indefinitely or for a stated period of time, to be awarded a Contract, if he at any time determines that the Tenderer or the Contractor has engaged in Corrupt or Fraudulent practices in competing for, or in executing, the contracts.

12. BMRCL reserves the right to accept or reject any of all Tenders in part or full without assigning any reasons. No Tenderer shall have any cause of action or claim against BMRCL for rejection of his Tender.

13. Registered Tenderers with e-token are advised to frequently check the e-Procurement portal for any amendments like Addendum / Corrigendum.

14. BMRCL will not be held responsible for consequential damages/losses due to lack /interruption of power supply & internet, low speed of internet, System problems, loss of electronic information/data etc.

15. For further clarifications/details regarding the Tender document, contact: Mr. **Chandra Shekhar Gupta (Executive Director)**, BMRCL on +918277891798, E-mail: csgupta@bmrc.co.in.

    For any query regarding e-Procurement portal/ Tender submission, please contact helpdesk at+91-80-46010000, +91-80-68948777, Email: support@eprochelpdesk.com.

Managing Director

Bangalore Metro Rail Corporation Limited

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SECTION – 2 - INSTRUCTIONS TO TENDERERS

A. GENERAL

1. Description of the work

Bangalore Metro Rail Corporation limited (BMRCL), a Special Purpose Vehicle (SPV) established under the Companies Act, 1956 (hereinafter referred to as “BMRCL” or “the Company” or “the Employer” or “the Client”), invites Tenders following Single Stage Three Cover Tender procedure, from the eligible Tenderers for “**Manufacturing, Supply and Laying of Cable Trough for Reach-3 Extension and Reach-6 (New Line) of Phase-II**" (hereinafter referred to as "the works") as per terms and conditions contained in this Tender documents.

2. Eligible Tenderers

2.1 Tenderers shall not be under a declaration of ineligibility for corrupt and fraudulent practices issued by the Government of Karnataka or BMRCL.

2.2 Tenders from Joint ventures / consortium are not acceptable.

2.3 The Tenderer should not have been blacklisted/debarred by any Government / Government undertaking / semi Government / Government controlled institutions / projects / Reputed private organizations in India during last five (5) years. Also, the Tenderer should not have rescinded the Works after award of the contract during last five (5) years. The Tenderer shall provide an undertaking as provided at Annexure-4.

Note: Last five (5) years shall be counted from 28 days prior to the date of submission of the Tender.

3. Qualification of the Tenderer

Tenderers who meet the below specified minimum Qualification Criteria will only be qualified.

3.1 **Tender Capacity:**
Eligible Tenderers will be qualified only if their available Tender capacity is more than the total Tender value. The available Tender capacity will be calculated as under:

Assessed available Tender capacity = (A x N x 1.5 - B)

Where;

A = Maximum value of works executed in any one year during the last five years (updated to FY 2022-2023 price level) taking into account the completed as well as works in progress.

N = Number of years prescribed for completion of the works for which Tenders are invited.

B = Value, at FY 2022-2023 price level, of existing commitments and on-going works to be completed during the next **08** Months.

Note: *The statements showing the value of existing commitments and on-going works as well as the stipulated period of completion remaining for each of the works listed should be countersigned by the respective Employer-in-charge, not below the rank of an Executive Engineer or equivalent.*

3.2 **Work Experience:**

a. The tenderer shall be either an individual or a company registered under the provisions of companies' act, 1956 or a partnership under the Indian partnership act and registered as contractor in KPWD / CPWD/ Central GOVT/ State GOVT for civil Engineering works.

b. Tenderer must have his own/hired/leased casting area/premises with all requisite plant and machineries for such casting work. Tenderer shall furnish a self-declaration to this effect indicating location and casting yard area with the facilities available etc. while submitting the tender documents.

3.3 All Tenderers shall provide the requested information accurately and in sufficient detail in **Section 3: Qualification Information**

3.4 To qualify for award of this Contract, each Tenderer should have performed the work as Prime Contractor/Sub Contractor or JV/Consortium Member in its name: -

a) Achieved average annual turnover of Rs. **1,90,22,294.00/-** during the last three (3) financial years ending 31-03-2023.

b) Experience of having successfully completed civil works during last 7 years ending last day of month previous to the one in which Tenders are invited should be either of the following: -

1. Three completed works costing not less than the amount equal to Rs. **2,53,63,059/-** each.

or

2. Two completed works costing not less than the amount equal to Rs. **3,17,03,824/-** each.

or

3. One completed work costing not less than the amount equal to Rs. **5,07,26,118/-** .

c) One work of Manufacturing and laying / Erection of precast cable trough / Precast concrete Structures of value not less than Rs.**1,58,51,912/-** during the last 7 years ending.

Note: 1. Sub-clauses 3.4(b) & 3.4(c) above should be duly supported by copy of Client certificates, without which the experience shall not be considered.
2. Last Seven (7) years shall be counted from 28 days prior to the date of submission of the Tender.
3. For arriving at cost of work, the value of work shall be brought to current price level by enhancing the actual value of work at simple rate of Seven percent (7%) per annum, calculated from the date of completion.

3.5 Each Tenderer should further demonstrate:

a) Applicants should deploy a minimum plant and machinery as mentioned below either owned or to be made available on hire or lease for this work. In this connection the tenderer must give an undertaking to deploy plant and machinery (Performa letter or Declaration and Undertaking).

1. Concrete Batching Plant of 30cum/hr. capacity – 1 No.
2. Crane 1.5Ton – 1 no.
3. Truck/Trailer 10T Cap -1 No.

b) Liquidity: Banking reference and certificate from its branch (scheduled bank as defined in section 29(e) of RBI Act, 1934 read with second schedule) in the form to demonstrate that it has access to or has available liquid assets, lines of credit and other financial means sufficient to meet the required cash flow after meeting its commitments for other contracts and liabilities for a sum of Rs. **1,58,51,912/-**

3.6 Deleted

3.7 Deleted

3.8 Even though the Tenderers meet the above Qualification criteria in accordance with ITT Clause 3, they are subject to be disqualified if they have:

1. Made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirements; and/or
2. Record of poor performance such as abandoning the works, not properly completing the Contract, inordinate delays in completion, litigation history, or financial failures etc.; and/or
3. Participated in the previous Tender for the same work and had quoted unreasonably high Tender prices and could not furnish rational justification.

4. Cost of Tendering

4.1 The Tenderer shall bear all costs associated with the preparation and submission of its Tender and BMRCL will in no case be responsible or liable for these costs, regardless of the conduct or outcome of the Tender process.

4.2 The Tenderers shall be deemed to have inspected and examined the site and collected all necessary information regarding all factors and conditions likely to influence in carrying out the work, before uploading on e-Procurement portal and submitting his Tender.

B. TENDER DOCUMENTS

5. Content of Tender documents

5.1 Tendering procedures and Contract terms are prescribed in the Tender documents. The Tender document shall include:

Volume 1: Qualification cum Technical Package

1. Notice Inviting Tenders (NIT)
2. Instructions to Tenderers (ITT)
3. Qualification Information
4. Form of Tender
5. General Conditions of Contract (GCC)
6. Special Conditions of Contract (SCC)
7. Technical Specifications
8. Drawings
9. Proforma of Bank Guarantees
10. Annexures
11. Safety, Health and Environmental (SHE) manual

Volume 2: Financial Package

1. Preamble to Bill of Quantities.
2. Bill of Quantities.
3. Financial Bid Proposal Sheet.

5.2 The Tenderer is expected to examine all Instructions, Forms, Terms, and Specifications in the Tender documents. Failure to furnish all information required by the Tender documents or submission of a Tender not substantially responsive to the Tender documents in every respect will be at the Tenderer's risk and may result in rejection of its Tender.

6. Clarification of Tender Documents

6.1 Tenderers shall carefully examine the Tender documents and fully understand the conditions and matters which may affect the work or the cost thereof. In case the Tenderer finds any discrepancies or omission from the specification or other documents, or in doubt as to their meaning, the Tenderer shall at once address query(ies) online through Karnataka Public Procurement Portal (e-Procurement portal).

6.2 BMRCL will offer clarification to such queries received through eProcurement portal up to the date specified therein. Any such queries with details of clarification sought, will be uploaded in the eProcurement portal (https://eproc.karnataka.gov.in) without disclosing the identity of the Tenderer seeking clarification. No separate future communication in this regard will be entertained.

6.3 Pre-bid meeting:

6.3.1 The Tenderer or his authorized representative is invited to attend a Pre-bid meeting held at the Place, date and time indicated in key details/eProcurement Portal.

6.3.2. The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage to enable the Tenderers to submit Tenders without conditions.

6.3.3. The Tenderer is requested to submit any questions online through Karnataka Public Procurement Portal (e-Procurement portal) only, in terms of ITT clause 6.1.

6.3.4. Non-attendance at the Pre-bid meeting will not be a cause for disqualification of a Tenderer.

7. Amendment of Tender documents

7.1 At any time prior to the deadline for submission of Tenders, the Employer may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective Tenderer, modify the Tender documents by an Addenda/Corrigendum.

7.2 Such Addendum/Corrigendum will be uploaded in the eProcurement portal. It will be the responsibility of the Tenderer to frequently check the eProcurement portal for any Addenda/Corrigenda or any other updates issued from time to time and ensure submission of Tender accordingly.

7.3 The Tenderer is not permitted to make any alteration /modifications to the Tender conditions. No modifications to the specifications, item descriptions, etc. will be entertained.

7.4 Without prejudice to the order of preference, the provisions in such addenda shall take priority over the Tender document issued previously. The Tenderers should acknowledge receipt of such addenda and list them in the Tender submittals.

8. Language of Tender

8.1 The Tender prepared by the Tenderer, as well as all correspondence and documents relating to the Tender exchanged by the Tenderer and the Employer, shall be in English language. Supporting documents and printed literature furnished by the Tenderer may be in another language provided they are accompanied by an accurate translation of the relevant passages in the English language in which case, for purposes of interpretation of the Tender, the translated version in English shall govern.

C. PREPARATION OF TENDERS

9. Documents comprising the Tender

9.1 The Tender submittals shall comprise the following documents and Tenderer shall upload clear and readable scanned copies of these documents on e-Procurement Portal.

i) **Qualification cum Technical Package**

a. Tender Security/EMD, in accordance with ITT clause 14.
b. Covering Letter stating any other matter in relation to his tender which the Tender considers should be drawn to the particular notice of BMRCL.
c. Qualification Information Form and Documents (in accordance with Section3) and any other submissions as per requirements of Tender Document;
d. The Form of Tender (in the format indicated in Section 4),
e. Details of Bank Account as per Annexure-3, Section-10.
f. Format of Declaration towards Debarment/Blacklisting as per Annexure-4, Section-10.
g. Undertaking as per Annexure-5, Section -10.

and any other documents required to be completed and submitted by Tenderers in accordance with these instructions. **The documents listed under Sections 3 and 4 shall be filled in without exception.**

ii) **Financial Package**

a. The Tenderer shall fill in and complete the Bill of Quantities (in the format indicated in Volume 2) online through Karnataka Procurement Portal only and **no hardcopy of commercials should be attached or disclosed elsewhere**.

9.2 **Original Documents (Hardcopy):**

The Tenderer is required to submit the following documents in original (hard copy) with in the time and place mentioned in ITT clause 16.7.

a. Tender Security/Earnest Money Deposit(EMD), as per clause 14
b. Notarized Power of Attorney and Board resolution (as applicable) as per ITT clause 15.
c. Any other documents as specified in tender document.

In case of failure in submission of the above documents within stipulated date, the Tender may be treated as incomplete and be liable for rejection.

10. Form of Tender

The Tenderer shall complete the Form of Tender furnished in the Tender documents and submit duly signed and stamped along with the Qualification cum Technical Package. The

Tenderer shall submit the Priced Bill of Quantities indicating the percentage (above or below or at par) and amount with the Financial Package.

11. Tender prices

11.1 The Contract shall be for the whole of the Works as described in Clause 1.0 of ITT, based on the priced Bill of Quantities submitted by the Tenderer.

11.1.1 **Taxes & Duties:**

11.1.2 The quoted price shall be the complete requirement of the Works specified on a single responsibility basis.

This is a Works Contract:

a. The quoted price shall be inclusive of all applicable taxes, duties and Cess under applicable Acts, but exclusive of CGST and SGST as specified under GCC Clause 39. BMRCL will pay the Output CGST and SGST on value of supplies/works done as invoiced by the contractor, at rates as per applicable Law.
b. In case of import, it should be done against Contractor's Import License. Custom Duty, Port handling and associated expenses shall be included in the Contract price in Indian Rupees.
c. The Evaluation and comparison of tenders shall be made accordingly, by BMRCL. No Claim will be entrained on this account after acceptance of the tender or during the currency of the Contract.
d. BMRCL has registered itself in TReDS platform for acceptance of contractor's bills (factor unit), in case the contractor opts for the same.

11.1.3 Income tax and other statutory deductions of the State & Central Government as applicable from time to time shall be made from the Contractor's Bills & directly remitted to concerned department by BMRCL. If the income tax is to be deducted at lower rate, then the Contractor has to furnish a lower deduction certificate issued by the jurisdictional IT authorities.

11.1.4 The Contractor shall maintain complete records in respect of payments made by them as required by Law. The Contractor shall furnish along with the 2nd and subsequent bills copies of all the purchases of Goods and Services made within the State of Karnataka

11.2 The Tender is a **Percentage Tender**. The Cost of all the individual items shall be computed for the entire work and the Tender Premium (above or below or at par) on the Total (Estimated) cost shall be quoted. Any additional item not found in the BOQ and if it is required to be executed for completion of the work under this Contract, the rate for which shall be as per KPWD schedule of Rates of the respective year above or below Tender premium which the BMRCL has accepted. If the item required is not found in any of the schedule of Rates of KPWD or CPWD, then rate shall be worked out as stipulated in GCC Clause 35.

11.3 The Percentage quoted by the Tenderer shall be fixed for the duration of the Contract and shall not be subject to adjustment on any account, unless provided otherwise in the General Conditions of Contract.

11.4 A Tender submitted with an adjustable price quotation will be treated as non-responsive and rejected, pursuant to ITT Clause 24.

11.5 The rates / percentage should be written in numerical up to two decimals (02) only. The same shall be clearly written in words. If the Tenderer indicates anything other than numerical, the Tender will be summarily rejected.

11.6 Proof of GST paid to the Government shall be submitted to BMRCL along with succeeding Bills and also, the GST paid against the final bill shall be submitted before release of Performance Bank Guarantee/ e-BG.

12. Tender Currency

12.1 Prices shall be quoted in Indian Rupees only.

13. Tender validity

13.1 Tenders shall remain valid for a period as specified in Appendix to Form of Tender (Section 4) after the deadline date for Tender submission specified in Clause 17 of ITT. A Tender valid for a shorter period shall be rejected by the Employer as non-responsive.

13.2 In exceptional circumstances, prior to expiry of the original time limit, the Employer may request that the Tenderer's may extend the period of validity for a specified additional period. The request and the Tenderers responses shall be made in writing or by cable. A Tenderer may refuse the request without forfeiting his Earnest Money Deposit / Tender Security. A Tenderer agreeing to the request will not be required or permitted to modify his Tender but will be required to extend the validity of his Earnest Money Deposit / Tender Security for a period of the extension, and in compliance with Clause 14 in all respects.

14. Earnest Money Deposit (EMD) / Tender Security

14.1 The Tenderer shall furnish, as part of its Tender, interest free Tender Security/ EMD as per Karnataka Public Procurement Portal. The Tender Security / EMD is required to protect BMRCL against the risk of Tenderer's conduct which would warrant the security's forfeiture.

14.2 The Tenderer shall furnish with his Tender an EMD (Tender Security) for the value indicated in e-Procurement portal in the following mode:

a. The Tenderer shall pay full EMD (Tender Security) as mentioned on the e-Procurement portal in the form of a Bank Guarantee (BG)/Electronic Bank Guarantee issued in favour of 'Bangalore Metro Rail Corporation Ltd', from Indian Schedule Bank (excluding Co-operative banks) or from a Scheduled Foreign Bank as defined in section 2(e) of RBI Act 1934 read with Second schedule preferably drawn on and payable and extendable at a designated Branch in Bangalore, as per the proforma given in Proforma-B, Section-9.

The Tender Security/EMD shall remain valid for a period specified in 'Appendix to Form of Tender'. The validity of Tender Security/ EMD shall be extended by the Tenderer suitably in line with the extension of Tender validity as per ITT clause 13.

The scheduled bank issuing the Bank Guarantee/ e-BG should preferably be on "Structure Financial Messaging System (SFMS)" platform. A separate advice of the BG shall preferably be sent by the issuing bank to the Employer's Bank through SFMS.

The issuing Bank shall send the SFMS to:

Name: BANGALORE METRO RAIL CORPORATION LTD.,

Name of the Bank: BANK OF INDIA

Branch: CANTONMENT BRANCH, BENGALURU.

Account No.: 840420110000760

RTGS/IFSC: BKID0008404

The Scanned copy of the BG and a copy of "MT760COV (for Electronic Bank Guarantee message) /MT767COV (for Electronic Bank Guarantee amendment message) Report" sent by BG issuing Bank, should be uploaded by the tenderer in the e-Procurement Portal as a part of his offer during tender submission. The tenderers should ensure that both the documents (scanned copy of BG and copy of SFMS message) are uploaded to the e-Procurement portal, failure of which, the tender will be summarily rejected by the Employer. The Original Bank Guarantee shall compulsorily be submitted in the BMRCL office before scheduled date, time and place as specified under ITT clause 16.7. The tenderer shall note that the Original Bank Guarantee submitted through speed post / in person and if not received before the scheduled date and time as specified in ITT clause 16, the Tender will be summarily rejected.

The details of the Bank guarantee, physically submitted should match with the details available of the scanned copy uploaded and the data entered during Tender submission time, failing which, the Tender will be rejected.

In case of non-reconciliation of online EMD (Tender Security) portion through e-Procurement portal in Government of Karnataka central pooling account held at the ICICI Bank, the tender will get rejected.

14.3 Tender Security/EMD will not be accepted in any form other than those mentioned above. Tenders not accompanied by the required amount of Tender Security/EMD and non-submission of hardcopy as per ITT clause 16.7 will be rejected by the Employer.

However, BMRCL reserves the right to accept or reject the Tender Security/EMD with any deficiency otherwise not materially affecting the technical qualification criteria of the Tenderer.

14.4 The Tender Security/EMD of unsuccessful Tenderers will be released / returned, when the Contract Agreement has been signed with the successful Tenderer. However, the Tender security of the successful Tenderer will be released/returned on receipt of the Performance Security/ Security Deposit by the Employer and upon signing of the Contract Agreement as per Annexure-1, Section 10.

14.5 The Tender Security/EMD may be forfeited:

a. If a Tenderer withdraws his Tender during the period of Tender validity,

OR

b. If a Tenderer resiles abandon from a Tender,

OR

c. In case the successful Tenderer fails to:

i) Furnish the required Performance Security/Security Deposit as per ITT clause 30, and

ii)sign the Contract Agreement as per ITT clause 29 and GCC clause 12.

14.6 The tender will be summarily rejected by the Employer in case of:

a. Failure to deposit online EMD portion or failure to upload clear & readable copy of Bank Guarantee towards EMD.

b. Failure to submit the original Bank Guarantee to BMRCL office within the date & time specified,

c. If EMD (Tender Security) is in the form of Bank Guarantee/ e-BG and is from any source other than an Indian Scheduled Bank and Scheduled Foreign Bank as defined in section 2(e) of RBI Act 1934 read with Second Scheduled.

d. EMD (Tender Security) in the form of Bank guarantee/ e-BG is from a Co-operative bank.

e. EMD (Tender security) amount is less than the required amount as mentioned in NIT.

f. Bank Guarantee's/ e-BG Validity is less than Tender as mentioned in ITT clause 14.2.

In case EMD (Tender Security) is in the form of BG, and BG validity fulfils the "Tender validity Period", but falling short in regard to period of "EMD (Tender Security) Validity', the Employer shall request such Tenderer(s) in writing to submit compliance EMD Tender Security) within 10 (ten) working days from the date of request. Failing to provide a compliant EMD Tender Security) within the prescribed period shall cause the rejection of the Tender and it will be considered as Non-responsive.

14.7 In case the Bidder submits Electronic Bank Guarantee (e-BG), entity number of BMRCL for providing e-BG shall be: AAACB4881D (PAN of BMRCL).

14.8 If the Bidder has opted to submit the Tender Guarantee in the form of Electronic Bank Guarantee (e-BG), copy of the e-BG shall be uploaded/ attached in the KPP Portal.

15. Format and signing of Tender

15.1 The Tenderer shall follow and submit the Tender documents in the respective formats prescribed under section 9-Proforma.

15.2 The Tender submittals shall be typed or written in indelible ink (wherever required), which is to be scanned and digitally signed using Class-III digital signature by person(s) duly authorized to bind the Tenderer to the contact. Proof of authorization shall accompany the Tender in the form of notarized "Power of Attorney". All pages of the Tender where entries, amendments, corrections, alterations, erasures etc., have been made shall be initialized by the person(s) signing the Tender.

15.3 The Tender shall contain no alterations or additions, except those to comply with instructions issued by the Employer, or as necessary to correct errors made by the Tenderer, in which case such corrections shall be initiated by the person signing the Tender.

15.4 Any individuals signing the Tender or other documents connected therein should specify whether he is signing:

(i) as sole proprietor of the firm or as attorney of the sole proprietor;

(ii) as a partner or partners of the firm;

(iii) as a Director, Manager or Secretary in the case of a limited company with a copy of Notarized Power of Attorney duly authorized by a resolution passed by the Board of Directors or in pursuance of the authority conferred by Memorandum of Articles of Association.

15.5 The original Notarized Power of Attorney or other documents empowering the individual or individuals to sign should be furnished to the Employer for verification, if required.

D. SUBMISSION OF TENDERS

16. Sealing and marking of Tenders

16.1 ALL Tender proposals digitally signed along with the other Qualifying documents should be submitted Electronically through Karnataka Public Procurement Portal on or before the last date and time for Tender submission as published therein.

16.2 Tenderer, in advance should get ready the Proposal documents to be submitted as indicated in the Tender document /schedule in PDF/JPEG formats.

16.3 Tenderer should log into the portal well in advance for the submission of the proposal so that it gets uploaded well in time i.e. on or before the last date & time for Tender submission. Tenderer will be solely responsible for any delay due to other issues.

16.4 The Tenderer has to digitally sign and upload the required proposal documents one by one as indicated in the tender document.

16.5 The server time (which is displayed on the dashboard) will be considered as the standard time for referring the deadline for submission of the proposals by the Tenderers, opening of proposal etc. The tenderers should follow this time during proposal submission.

16.6 The necessary certificates/documents in support of fulfilling eligibility criteria and Technical requirements shall be scanned and attached to e-Procurement portal.

16.7 Original Documents to be submitted in hardcopy:

The Tenderer shall seal and submit the original documents listed in ITT clause 9.2 in original (hard copy) by speed post or in person at BMRCL office within 5 days of last date of online Tender submission. Only the tenders submitted & accepted online, the hardcopies will be considered for evaluation. The hardcopies should carry/accompany copy of "soft copy submitted, time and acceptance acknowledgement from Employer/eProcurement Portal.

The envelop shall bear the following identification:

TENDER NO: …….
ORIGINAL SUBMITTALS OF QUALIFICATION CUM TECHNICAL PACKAGE

BMRCL Office Address for submission of hardcopy:

To
The Executive Director (Traction),
Bangalore Metro Rail Corporation Limited,
III Floor, BMTC Complex,
K.H. Road, Shanthinagar,
Bangalore-560 027,
Karnataka, India.

The Tenderers can submit the hard copies by 'Speed Post' or 'in person' at the above address during 11.00 am to 05.00pm on all working days. In case, 5th day happens to be holiday, then the next working day shall be considered as last day for submission of the hard copy.

16.8 All tenderers have to submit ''unconditional Tenders and without any deviations", together with requisite Tender Security/EMD.

17. Deadline for submission of the Tenders

17.1 Tenders must be submitted online through Karnataka Public Procurement Portal on or before the date and time as specified in the eProcurement Portal and in time submission of tender is the responsibility of the Tenderer. Original Documents (Hard copy) as listed under ITT clause 9.2 shall be submitted in the place, date & time as specified in ITT clause 16.7.

17.2 BMRCL may, at their discretion, extend the deadline for submission of tenders by issuing an amendment in which case all rights and obligations of BMRCL and the Tenderers Previously subject to the original deadline shall thereafter be subjected to the new deadline as extended.

18. Late Tenders

18.1 In online e-Procurement Portal, the Tenderer shall not be able to submit the Tender after the last date and time for submission as the icon for the task in the e-Procurement Portal will be disabled.
Hardcopies received by BMRCL after the deadline for submission as mentioned in ITT clause 16.7 will be rejected.

19. Modification and Withdrawal of Tenders

19.1 Tenderer may notify and correct or upload any relevant document in the portal till Tender submission date and time as published in the e-Procurement Portal.

19.2 No Tender shall be modified subsequent to the deadline for submission of Tenders.

19.3 **Withdrawal or modification of a Tender during the intervening period between the deadline for submission of Tenders and the expiration of the period of Tender validity specified by the Tenderer in the Tender Form will result in forfeiture of Tender Security/EMD pursuant to ITT clause 14.**

E. TENDER OPENING AND EVALUATION

20. Tender opening

20.1 **Qualification Cum Technical Package:**

20.1.1 Opening of 'Qualification Cum Technical Package' of all Tenders:

The Employer will open the 'Qualification Cum Technical Package' of all the Tenders received through e-Procurement Portal at the time and date specified in the eProcurement Portal.

Before opening the 'Qualification Cum Technical Package' of a Tenderer, the Employer will verify the EMD First. If EMDs are not in proper form, the 'Qualification Cum Technical Package' will not be opened for such tenderers. Interested tenderers of their authorized representatives who choose to attend or may view the same on the portal on the scheduled date and time from their end. In the event of the specified date for Tender opening being declared a holiday by the employer, the Tenderers will be opened at the appointed time and located on the next working day.

20.1.2 The Tenderers will be examined for the following submittals:

i) Presence of valid Tender Security/EMD

ii) Presence of 'Qualification cum Technical Package' and all enclosures as per ITT clause 9.1 and,

iii) Submission of original documents as per ITT clause 9.2.

20.1.3 The Employer will evaluate and determine whether each Tender (a) meets the eligibility criteria defined in ITT Clause 2; (b) is accompanied by the required **Earnest Money Deposit** as per stipulations in ITT Clause 14; and (c) meets the minimum qualification criteria stipulated in ITT Clause 3. The Employer will draw out a list of qualified Tenderers.

20.1.4 If ant Tender contains ant deviation from the Tender documents and /or if the same does not contain Tender Security in the manner prescribed in the Tender documents, then that Tender is liable for rejection. Incomplete Tenders in respect of above would be rejected.

Tenderers, whose 'Qualification cum Technical Package' are found acceptable after evaluation, would be informed of the date and time of opening of 'Financial Package' through e-Procurement Portal.

20.2 **Financial Package:**

The Financial Package of the tenderers, whose 'Qualification cum Technical package' were found acceptable, will be opened in the presence of those Tenderers of their representatives, who choose to be present and also can view the opening on e-Procurement portal from their end. In the event of the specified date for Financial Package opening being declared a holiday by the Employer, the Tenders will be opened at the appointed time on the next working day.

The Tenderer's name, the Percentage rate (above or below or at par), tender price, the total amount of each Tender, any discounts, Tender Modifications and Withdrawals, and such other detail as the Employer may consider appropriate, will be announced by the Employer at the opening.

Conditional Tenders are not acceptable and will be summarized rejected. The Employer shall prepare minutes of the Tender opening, including the information disclosed to those present and the minutes shall form part of the contract.

21. Process to be confidential

21.1 Information relating to the examination, clarification, evaluation, and comparison of Tenders and recommendations for the award of a Contract shall not be disclosed to Tenderers or any other persons not officially concerned with such process until the award to the successful Tenderer has been announced. Any effort by a Tenderer to influence the Employer's processing of Tenders or award decisions may result in the rejection of his Tender.

22. Clarification of Tender submittals

22.1 To assist in the examination, evaluation, and comparison of Tenders, the Employer may, at his discretion, ask any Tenderer for clarification of his Tender, including breakdowns of unit rates. The request for clarification and the response shall be in writing or by cable, but no change in the price or substance of the Tender shall be sought, offered, or permitted except as required to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the Tenders in accordance with ITT Sub-clause 24.

22.2 Subject to ITT sub-clause 22.1, no Tenderer shall contact the Employer on any matter relating to its Tender from the time of the Tender opening to the time the Contract is awarded. If the Tenderer wishes to bring additional information to the notice of the Employer, it should do so in writing.

22.3 Any effort by the Tenderer to influence the Employer in the Employer's Tender evaluation, Tender comparison or Contract award decisions may result in the rejection of the Tenderers' Tender.

23. Examination of Tenders and determination of responsiveness

23.1 The Employer will examine the Tenders to determine whether they are complete, whether any computational errors have been made, whether required sureties have been furnished, whether the documents have been properly signed, and whether the Tenders are generally in order.

The Employer may waive any minor informality or non-conformity or irregularity in a Tender which does not constitute a material deviation, provided such a waiver does not prejudice or affect the relative ranking of any Tenderer.

23.2 A substantially responsive Tender is one which conforms to all the terms, conditions, and specifications of the Tender documents, without material deviation or reservation. A material deviation or reservation is one (a) which affects in any substantial way the scope, quality, or performance of the Works; (b) which limits in any substantial way, inconsistent with the Tender documents, the Employer's rights or the Tenderer's obligations under the Contract; or (c) whose rectification would affect unfairly the competitive position of other Tenderers presenting substantially responsive Tenders.

23.3 If a Tender is not substantially responsive, it will be rejected by the Employer, and may not subsequently be made responsive by correction or withdrawal of the nonconforming deviation or reservation.

24. Correction of errors

24.1 Tenders determined to be substantially responsive will be checked by the Employer for any arithmetic errors. Errors will be corrected by the Employer as follows:

(a) where there is a discrepancy between the rates/percentage in figures and in words, **the words will govern**; and

(b) Where there is a discrepancy between “quoted rate of percentage above /below/at par” and amount derived”, the quoted rate of percentage above/below/at par will govern and the amount will be calculated accordingly.

(c) If no percentage rate has been indicated either in words or figures, the percentage rate shall be considered at par and amount shall be calculated accordingly.

(d) Where there is a discrepancy between the unit rate/percentage and the line item total resulting from multiplying the unit rate by the quantity, the unit rate/percentage as quoted will govern, unless in the opinion of the Employer there is an obvious gross misplacement of the decimal point in the unit rate, in which case the line item total as quoted will govern and the unit rate/percentage will be corrected.

(e) If more than one percentage is quoted, then the Tender submitted by the Tenderer will be rejected.

24.2 The amount stated in the Tender will be adjusted by the Employer in accordance with the above procedure for the correction of errors and shall be considered as binding upon the Tenderer. If the Tenderer does not accept the corrected amount the Tender will be rejected, and the Earnest Money Deposit shall be forfeited in accordance with ITT Clause 14.5.

25. Evaluation and comparison of Tenders

25.1 The Employer will evaluate and compare only the Tenders determined to be substantially responsive in accordance with ITT Clause 23. No Tender will be considered if complete requirements covered in the scope of work is not included in the Tender.

25.2 In evaluating the Tenders, the Employer will determine for each Tender the evaluated Tender Price by adjusting the Tender Price as follows:

(a) making any correction for errors pursuant to ITT Sub-clause 24; and

(b) Making appropriate adjustments to reflect discounts or other price modifications offered.

25.3 The Employer reserves the right to accept or reject any variation, deviation, or alternative offer. Variations, deviations, and alternative offers and other factors which are in excess of the requirements of the Tender documents or otherwise result in unsolicited benefits for the Employer shall not be taken into account in Tender evaluation.

25.4 The Tenders received will be evaluated by the Employer to ascertain the lowest acceptable Tender in the interest of the Employer, as specified in the specification and Tender documents. Evaluation criteria not mentioned herein but mentioned specifically in the technical specifications will be taken into consideration in the evaluation of offers.

F. AWARD OF CONTRACT

26. Award criteria

26.1 Subject to ITT Clause 28, the Employer will award the Contract to the Tenderer whose Tender has been determined to be substantially responsive to the Tender documents and who has offered the lowest evaluated Tender Price, provided that such Tenderer has been determined to be;

(a) Eligible in accordance with the provisions of ITT Clause 2, and

(b) Qualified in accordance with the provisions of ITT Clause 3.

26.2 **Notwithstanding the Clause 26.1,** BMRCL reserves right to accept the Tender in part or full which is monetarily beneficial to BMRCL. BMRCL's decision in this regard shall be final and binding.

27. Employer's right to vary Quantities during the Contract

27.1 The Employer reserves the right during the pendency of Contract to increase or decrease the quantity of the items originally specified in the Bill of Quantity without any change in unit price or other terms and conditions as defined GCC Clause 34 and the respective Special Conditions of Contract.

28. Employer's right to accept any Tender and to reject any or all Tenders

28.1 Notwithstanding Clause 26, the Employer reserves the right to accept or reject any Tender, and to cancel the Tender process and reject all Tenders, at any time prior to the award of Contract, without thereby incurring any liability to the affected Tenderer or Tenderers or any obligation to inform the affected Tenderer or Tenderers of the grounds for the Employer's action.

29. Notification of award and signing of Agreement

29.1 The Tenderer whose Tender has been accepted will be notified of the award by the Employer prior to expiration of the Tender validity period by cable, email, telex or facsimile confirmed by registered letter. This letter (hereinafter and in the General Conditions of Contract called the "Letter of Acceptance") will state the sum that the Employer will pay the Contractor in consideration of the execution, completion, and maintenance of the Works by the Contractor as prescribed by the Contract (hereinafter and in the Contract called the "Contract Price").

29.2 The notification of award will constitute the formation of the Contract, subject only to the furnishing of a performance security in accordance with the provisions of ITT Clause 30.

29.3 The Agreement will incorporate all agreements between the Employer and the successful Tenderer within 30 days of receipt of LOA, the successful Tenderer will sign the Agreement and deliver it to the Employer.

29.4 Upon the furnishing of the Security Deposit by the Successful Tenderer, the Employer will promptly notify the other Tenderers that their Tenders have been unsuccessful and will discharge its Earnest Money Deposit / Tender Security, pursuant to ITT Clause 14.

29.5 The costs of stamp duties and similar charges imposed by law shall be borne by the contractor.

30. Security deposit / Performance Security

30.1 Within **14 days** of receipt of the Letter of Acceptance, the successful Tenderer shall deliver to the Employer, a Security deposit in accordance with GCC Clause 25 for an amount as specified in 'Appendix to Form of Tender' (Section 4).

30.2 **Additional Performance Security:**
Tenderer shall furnish an additional Performance Security for abnormally low quoted Tenders which shall be calculated as below:

(i) If the Tender price offered by the lowest Evaluated Tenderer is lower than 10% but upto 20% of the Estimated cost, then the additional performance security shall be calculated @ 10% of the difference in the (a) Estimated cost (as mentioned in NIT) - 10% of the estimated cost and (b) the Tender price offered by the lowest evaluated Tenderer.

(ii) If the Tender price offered by the lowest evaluated Tenderer is lower than 20% of the estimated cost, then the additional Performance Security shall be calculated @ 15% of the difference in the (a) Estimated cost (as mentioned in NIT) - 10% of the estimated cost and (b) the Tender price offered by the lowest evaluated Tenderer.

30.3 Failure of the successful Tenderer to comply with the requirements of ITT Sub-Clause 30.1 shall constitute sufficient grounds for cancellation of the award and forfeiture of the Earnest Money Deposit.

31. Corrupt or Fraudulent practices

31.1 The BMRCL requires that the Tenderers observe the highest standard of ethics during the procurement and execution of such Government Financed Contracts. In pursuance of this policy, BMRCL:

(a) Defines, for the purposes of this provision, the terms set forth as follows:
(i) "Corrupt practice" means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in Contract execution; and

(ii) "Fraudulent practice" means any omission or misrepresentation of facts in order to influence a procurement process or the execution of a Contract to the detriment of BMRCL/Government, and includes collusive practice among Tenderers (prior to or after Tender submission) designed to establish Tender prices at artificial non-competitive levels and to deprive BMRCL of the benefits of free and open competition;

(b) Will reject a proposal for award if it determines that the Tenderer recommended for award has engaged in corrupt or fraudulent practices in competing for the Contract in question;

(c) Will declare a firm ineligible, either indefinitely or for a stated period of time, to be awarded a Government financed Contract, if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for, or in executing, a Government financed Contract.

31.2 Furthermore, Tenderers shall be aware of the provision stated in sub-clause 46.2 of the General Conditions of Contract.

32. One Tender per Tenderer

Each Tenderer shall submit only one Tender. A Tenderer who submits or participates in more than one Tender (other than as a sub-contractor or in cases of alternatives that have been permitted or requested) will cause all the proposals with the Tenderer's participation to be disqualified.

33. Site visit

The Tenderer at his own responsibility and risk is encouraged to visit and examine the Site of Works and its surroundings and obtain all information that may be necessary for preparing the Tender and entering into a Contract for construction of the Works. The cost of visiting the Site shall be at the Tenderer's own expense.
Certificate conforming visit to site shall be furnished with 'Qualification cum Technical package' in the form given in Annexure-7.

34. General terms

a) Time is the essence of this contract. works envisaged under this contract are required to be completed in stages as per 'Key Dates' mentioned in 'Attachment to Form of Tender' in all respects within **08 months** from the date of issue of Notice to Proceed.

b) The work at site shall be commenced in all earnestness within 20 days from the date of issue of Notice to Proceed failing which it would be presumed that the contractor is not interested in the work and action may be taken to get the work executed through an alternate agency all at the cost and sole risk of the contractor.

c) All standards, technical specifications and codes of practice referred to shall be latest editions including all applicable official amendments and revisions. The contractor shall make available at site all relevant specifications and standard codes of practice as applicable.

d) In case of discrepancy among standard codes of practice, technical specifications and provisions in sub clauses in this NIT, the order of precedence will be as below:

   i. Provisions in NIT
   ii. Technical specifications
   iii. Standard codes of practice

e) The levels, measurement and other information concerning the existing Viaduct site shown on the conceptual/layout drawings are believed to be correct, but the contractor should verify them himself and also examine the nature of the ground as no claim or allowance whatsoever will be not entertained on account of any errors or omissions.

f) The Contractor shall plan his works keeping in view restriction of approach and availability of space and time. The operations like handling/transportation of cable troughs may have to be carried out in nights also for which no claim will be entertained.

g) The Tenderer shall be deemed to have inspected the site and its surroundings beforehand and taken into account all relevant factors pertaining to the site in the preparation and submission of the Tender.

h) While all efforts have been made to avoid errors in the drafting of the tender documents, the tenderer is advised to check the same carefully. No claim on account of any errors detected in the tender documents shall be entertained.

--- xxx ---

SECTION 3: QUALIFICATION INFORMATION

1.0 The information to be filled in by the Tenderer hereunder will be used for purposes of evaluating the eligibility and qualification at the Tenderer as provided for in Clause 3 of the Instructions to Tenderers. This information will not be incorporated in the Contract.

1.1	Constitution or legal status of Tenderer	[Attach copy]
	Agency in which Registered (with Registration No.)	…… (Attach Copy)
	Principal place of business:	……

		Financial Year	Total Value of works for the year	Multiplication factor for updation of value of works to 2022-2023	Total value of Works updated to FY2022-2023
1.2	Total value of works (*) executed and payments received year wise in the last five years (in Rs. Lakhs) #	2018-19		1.28	
		2019-20		1.21	
		2020-21		1.14	
		2021-22		1.07	
		2022-23		1.00	

* Value of work as defined in ITT clause 3
# - Attach Certificate from practicing Chartered Accountant

1.3 Information on works which are yet to be completed and works for which Tenders have been submitted as on the date of this Tender.

(A) Existing commitments and on-going works:

Description of Work	Place & State	Contract No. & Date	Name and Address of Employer	Value of Contract (Rs. Lakh)	Stipulated period of completion	Value of works remaining to be completed (Rs. Lakh)	Anticipated date of completion
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

……..
……..

(B) Works for which Tenders already submitted:

Description of Work	Place & State	Name and Address of Employer	Estimated value of works (Rs. Lakh)	Stipulated period of completion	Date when decision is expected	Remarks if any
(1)	(2)	(3)	(4)	(5)	(6)	(7)

……..
……..

1.4 Name, address, and telephone, telex, and fax numbers of the Tenderers' bankers who may provide references if contacted by the Employer.

……
……

1.5 Work performed as Prime Contractor/Sub Contractor or JV/Consortium Member (in the same name) on works during the last seven years with respect to ITT clause 3.4 (b).

Project Name	Name of Employer	Description of Work	Contract Number	Value of contract Rs. Lakhs	Date of issue of Work order	Specified period of completion	Actual date of completion	Remarks explaining reasons for delay in completion of work
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

NOTE:

1. Last Seven (7) years shall be counted from 28 days prior to the date of submission of the Tender.
2. For arriving at cost of similar work, the value of work shall be brought to current price level by enhancing the actual value of work at simple rate of Seven percent (7%) per annum, calculated from the date of completion.

……..
……..

1.6 The following items of equipment are considered essential for successfully carrying out the works. The Tenderer should furnish all the information listed below;

Item of Equipment	Requirement			Owned and available		Remarks
	No.	Capacity	Owned	Number/ Capacity	Age/ Condition	
Concrete Batching Plant	1	30 Cum/Hr				
Crane	1	1.5T				
Truck/Trailer	1	10 T				

1.7 Reports on the financial standing of the Tenderer, such as profit and loss statements, balance sheet and Auditor's reports for the last five years;(provisional financial statements are not acceptable)

1.8 Qualification and experience of the key technical and Management personnel in permanent employment with the Tenderer and those that are proposed to be deployed on this Contract, if awarded.

1.9 Proposals for subcontracting components of works amounting to more than 20% of the Contract Price *[for each, the qualifications and experience of the identified subcontractor in the relevant fields should be attached.]*

Item of Work	Value of Sub-Contract	Identified Sub-contractor (Name and address)	Experience of similar work

……..
……..

1.10 Deleted

1.11 Evidence of access to financial resources to meet the qualification requirement specified in ITT Clause 3.5 (b): Cash in hand, Letter of Credit, etc. List them below and attach certificate from the Banker in the suggested format as under:

BANKER'S CERTIFICATE

This is to certify that M/s. …….. is a reputed company with a good financial standing If the Contract for this work, namely "…… *(name of the work)* ……" is awarded to the above firm, we shall be able to provide overdraft / credit facilities to the extent of Rs. …… to meet the working capital requirements for executing the above Contract.

SD/-
Name of the Bank, Senior Bank Manger
Address: …….

1.12 Information on litigations in which the Tenderer is involved and undertaking to be furnished as per the format given herein below:

Employer	Other Party(ies)	Details of dispute	Amount involved	Remarks showing present status

……..
……..

1.13 Organizing chart

The tenderer shall provide with the tenderer a complete schedule and organization chart with assignment of each key staff member (identified by name), duration and timing together with clear description of the responsibilities of each key staff member within the overall work program.

1.13.1 Minimum Qualification and experience required for key staff proposed:

Sl. no.	Designation	Qualification	Experience level
1	Project Manager (team leader)	Graduate in civil Engineering	Minimum 3 years as in-charge of similar works and minimum total experience 15 years
2	Civil Engineer (1)	Graduation/Diploma in civil Engineering	Total minimum experience 7 years
3	Quality Assurance (QA) in charge (1)	Graduation in civil Engineering/Diploma in quality assurance	Minimum 5 years in QA (field) out of which 1 year as in-charge Minimum total experience 7 years
4	Safety Officer (1)	Concerned degree/Diploma in construction safety	Minimum 5 years in safety (field) out of which 1 year as in-charge

Note:

1. Diploma with 5 years' experience in relevant field will be considered equivalent to degree.
2. Figures indicated in brackets are minimum key personnel required.
3. The majority of the key staff be regular members of the firm for at least six months.
4. A statement showing the following details to be enclosed along with CV'S.
   a. Name of key personnel proposed.
   b. Qualifications.
   c. Years with the company.
   d. Experience in similar works (years)
   e. Total work experience (years)

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SECTION 4: FORM OF TENDER

NIT No: …….

Description of Work: …….

To:
……,
……. *(name and complete address of the employer)*,
……,
Bangalore, PIN: ……..,
Karnataka, India.

Dear Sir / Madam,

Having examined and understood the Instructions to Tenderer, General Conditions of the Contract, Special Conditions of Contract, Technical Specifications and any other documents forming part of the Tender document issued under Tender notification no ---------- dated--------- including any addendum /amendments, the receipt of which is hereby duly acknowledged, I/We the undersigned, hereby submit the fully completed Tender documents in duplicate, which includes the following for the said work;

a) First Cover: Earnest Money Deposit / Tender Security
b) Second Cover: Qualification cum Technical Package
c) Third Cover: Financial Package

I/We hereby agree to execute the Contract in conformity with the Specifications & Conditions of Contract enumerated in the Tender Documents, for the sum stated & quoted in the Tender or such other sums as may be ascertained in accordance with the 'Priced Bill of Quantities' which are made part of 'Financial Package'.

This Tender and your written acceptance of it shall constitute a binding Contract between us. We understand that you are not bound to accept the lowest or any Tender you receive.

We undertake that, in competing for (and, if the award is made to us, in executing) the above Contract, we will strictly observe the laws against fraud and corruption in force in India namely "Prevention of Corruption Act 1988".

We hereby confirm that this Tender complies with the Tender validity and Earnest Money Deposit / Tender Security required by the Tender documents.

We undertake, if our Tender is accepted, to execute the Works in accordance with the Stipulated Completion Date specified in the 'Appendix to Form of Tender'.

If our Tender is accepted, we will submit the Performance Security for a sum equivalent to Ten (10) percent of the Contract Price for the due performance of the Contract, in the form as prescribed in the Clause 25 of GCC.

We agree to abide by this Tender for the Tender validity period specified in Clause 13 of the ITT and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

This Tender, together with your written acceptance thereof and your notification of award, shall constitute a binding Contract between us.

We confirm that we comply with the eligibility requirements as per ITT Clause 2 and clause 3 of the Tender documents.

Dated this ..... day of ..... 20 ....

Yours faithfully,

_____
(Signature) (in the capacity of)

Duly authorized to sign Tender for and on behalf of
"……"

(To be submitted duly printed, signed and stamped by the authorized signatory of the Tenderer on Tenderer's letter pad)

APPENDIX TO FORM OF TENDER

SALIENT FEATURES OF CONTRACTS (CONTRACT DATA)

1.	Employer's Name & Address	BANGALORE METRO RAIL CORPORATION LIMITED (BMRCL) III FLOOR, BMTC COMPLEX, K.H. ROAD, SHANTHINAGAR. Bangalore, PIN:560027 Karnataka, India
2.	Warranty / Defects Liability Period (GCC clause 50)	The Warranty/Defects Liability Period shall start from the date of acceptance by the Employer and shall continue until **12 months** from that date of acceptance as in GCC clause 32.
3.	Validity of Tender (ITT clause 13)	**120 days** from the latest date of submission of Tenders as per ITT clause 13.
4.	Earnest Money Deposit / Tender Security (See Clause 14 of ITT)	Tenderer shall submit with his tender, **Rs. 9,51,115/-** a Earnest Money Deposit / Tender Security as per the format at '**Proforma-A**' in its original form; copies will not be accepted. With its validity period 45 days beyond Tender Validity.
5.	Contractor's Name & Address with telephone No and e-mail id	……. *(To be filled in by the Tenderer)* ……
6.	Submission of queries and pre-bid meeting, date and time of Tender Submission, Tender opening, and Place.	• **Last date for submission of queries by Tenderers:** As specified in eProcurement Portal • **Date of Pre-bid meeting:-I.** As specified in eProcurement Portal • **Date for Tender Submission:** As specified in eProcurement Portal • **Date for Tender Opening:** As specified in eProcurement Portal • **Place:** Office of The Executive Director (Traction), Bangalore Metro Rail Corporation Ltd III floor, BMTC Complex, K.H Road, Shanthinagar, Bengaluru– 560 027, Karnataka, India.
7.	The Work consists of	Manufacturing, Supply and Laying of Cable Trough for Reach-3 Extension and Reach-6 (New Line) of Phase-II
8.	Start Date	The date of issue of 'Notice to Proceed'.
9.	The Stipulated Completion Date for the whole of the Works	Whole of the works shall be completed and delivered in stages in accordance to 'Key dates' mentioned.

10.	The following documents also form part of the Contract (See Clause 2.2 of GCC)	(1) Contract Agreement (2) Letter of Acceptance, notice to Proceed with the works (3) Instruction to Tenderers/ Bidders (4) General Conditions of Contract (5) Special Conditions of Contract (6) Form of Tender / Bid Form (7) Technical Specifications including scope of work (8) Priced Bill of quantities (9) Drawings (10) Employer's clarifications to Prebid queries, Addenda, if any. (11) Contractor's Proposals (12) All correspondence between the Tenderer and BMRCL from the date of issue of NIT and the date of issue of the LOA. (13) Any other document forming part of the Contract.
11.	Penalties for not achieving Key Dates (Ref: Attachment to Appendix to Form of Tender)	Penalties shall be levied as per Attachment to "Appendix to Form of Tender"
12.	Amount of **Performance Security** (See Clause 25 of GCC)	**10% of the Contract Value in INR.** In the event of variations during the execution of the Contract which result in payments to the Contractor over and above the original contract price, the Performance Security shall be suitably adjusted at every 6 month at the request of the Employer. The Performance Security shall be in the form of **Demand Draft / Pay Order / Banker's Cheque / Bank Guarantee** shall be drawn on and **payable / extendable at a designated branch in Bangalore.**
13.	Liquidated Damages (See Clause 40 of GCC)	(1) 0.05% of the contract price for each calendar day of delay in achieving KD-5 for the entire work. (2) The upper limit for Liquidity Damages is 10% + 5% (10% is direct LD and 5% is losses incurred due to delay for the Designated contractors) of Contract price indicated.
14.	Program & Methodology (see clause 21 of GCC)	Work Program & Methodology shall be submitted along with the tender document as mentioned in Section -3 Sl.No.1.17
15.	Payment upon Termination – **Computation of additional cost to the Employer** (GCC Clause 47.1)	The percentage to apply to the value of the work not completed representing the Employer's additional cost for completing the Works shall be **30 percent**.
16.	As-Built Drawings (If applicable as per GCC Clause 45)	1. The date by which "as-built" drawings (1:100) in 2 sets are required is within 30 days of issue of certificate of completion of Whole or Section of the Work as the case may be. 2. The amount to be withheld for failing to supply "as built" drawings by the date required is **1%** of the Final Contract Value.

<table>
<tr><td rowspan="6">17.</td><td rowspan="6">Insurance (GCC Clause 26)</td><td>Sl. No.</td><td>Type of Cover</td><td>Minimum cover for Insurance</td></tr>
<tr><td>(i)</td><td>Works and of Plant and materials</td><td>The Sum stated in the Agreement plus 20%</td></tr>
<tr><td>(ii)</td><td>Loss or damage to equipment</td><td>Full replacement cost</td></tr>
<tr><td>(iii)</td><td>Loss or damage to property</td><td>Full replacement cost</td></tr>
<tr><td>(iv)</td><td>Personal injury or death Insurance

(a) For Third Party</td><td>10% of the contract price or INR 10 Crores whichever is lesser.</td></tr>
<tr><td></td><td>(b) For Contractor’s Employees or labour</td><td>In accordance with the statutory requirements applicable to Karnataka.</td></tr>
<tr><td>18.</td><td>The Schedule of Key and Critical Equipment to be deployed on the work as per agreed program of Works (GCC Clause 21)</td><td colspan="3">1. Concrete Batching Plant of 30 Cum/hr. Capacity- 1No.
2. Crane 1.5Ton – 1No.
3. Truck/Trailer 10T Cap -1No.</td></tr>
</table>

Attachment to Appendix to Form of Tender

Key Dates:

The Contractor will be required to achieve the following Key Dates (KD) to be calculated from the date of issue of Notice to Proceed.

KD no.	Activity	Key Dates from the date of issue of NTP	Penalty for Not Achieving the specified Key Dates
KD -1	Procurement Mould and mock up casting for cable trough works for Reach-3 Extension and Recah-6 of Phase-II.	01 month	INR 10,000/- (INR Ten Thousand) per day for delay in not achieving the KD-1
KD -2	Procurement of moulds for casting of cable troughs, cover slabs and casting of 50% of troughs including cover slab and laying in Recah-3 Extension of phase-II.	02 months	INR 5,000/- (INR Five Thousand) per day for delay in not achieving the KD-2
KD -3	Completion balance 50% of the cable trough works and laying in Recah-3 Extension and 25% casting for Recah-6 of Phase-II.	03 months	INR 5,000/- (INR Five Thousand) per day for delay in not achieving the KD-3
KD -4	Casting and Laying of precast cable troughs and cover slabs (i.e. 50% quantity) in Reach-6 of Phase-II.	05 months	INR 5,000/- (INR Five Thousand) per day for delay in not achieving the KD-4
KD -5	Completion of the works as whole, including casting and fixing of cable troughs and slabs (covering 100%) in Reach-6 of Phase-II	08 months	As per Sl.No.13 of Appendix to Form of Tender

Note:

1. The penalties levied for not achieving the intermediate key dates may be refunded at the discretion of the Engineer, if the whole work is completed in time.

2. The penalties levied against KD-1 to KD-4 above will be in addition to the Liquidated Damages to be levied as per relevant GCC clause/s, 'Form of Tender' and 'Appendix to Form of Tender'.

3. Tenderer is required to note that in the Viaduct/Stations, civil structures works are under progress. Therefore, full stretch/full area of Viaduct /Stations will not be made available to perform this contract in the beginning and it will be made available progressively (in stages) thereafter. Handing over of site areas, access details will be provided to the successful Tenderer after award of contract. Tenderer is required to note that nothing extra shall be payable because of partial handing over of area and no claims will be entertained for the same. However reasonable extension of time shall be given, the Contractor is required to work in the sequencing manner and also to interface with designated contractors during the construction activities.

4. The Engineer will decide about completion of work regarding all key dates. The certificate on completion of each key date including the final key date of completion will be issued by the Engineer and the date of completion as mentioned on each of certificate will be the decisive date for levy of the Penalty / liquidated damages or otherwise.

5. These liquidated damages shall not relieve the contractor from his obligation to complete the works or from any other obligations and liabilities under this contract.

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SECTION 5: GENERAL CONDITIONS OF CONTRACT

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GENERAL CONDITIONS OF CONTRACT

A. General

1. Definitions

1.1 Terms which are defined in the 'Appendix to Form of Tender' are not also defined in the General Conditions of Contract but keep their defined meanings. Bold letters are used to identify defined terms.

a. **"Bill of Quantities"** means the priced and completed Bill of Quantities forming part of the Tender.

b. The **"Completion Date"** is the date of completion of the whole of the Works certified by the Employer in accordance with Sub Clause 42.1 of GCC.

c. The **"Contract"** is the Contract between the Employer and the Contractor to execute, complete and maintain the Works. It consists of the documents listed in Clause 2.2 of GCC. "The Contract" means and includes Contract Agreement, Notice Inviting Tender, Instructions to Tenderer, General Conditions of Contract, Special Conditions of Contract, Technical Specifications, Drawings, Form of Tender, Bill of Quantities signed by the Employer and the Contractor, including all the attachments and appendices thereto and all documents incorporated by reference therein;

d. The **"Contractor"** is a person or corporate body whose Tender to carry out the Works has been accepted by the Employer. It means the person, firm or company with whom the order of the Works is placed and shall be deemed to include the Contractor's successors (approved by the Employer), representatives, heirs, executors and administrators, as the case may be unless excluded by the terms of the Contract;

e. The **"Contractor's Tender"** is the completed Tender document submitted by the Contractor to the Employer.

f. The **"Contract Value"** or **"Contract Price"** means the price payable to the Contractor under the Contract for the full and proper performance of its Contractual obligations;

g. **"Days"** are calendar days; **"months"** are calendar months.

h. A **"Defect"** is any part of the Works not completed in accordance with the Contract.

i. The **"Defects Liability Period"** is the period mentioned in the 'Appendix to Form of Tender' and calculated from the Completion Date in accordance with Clause 50 of GCC.

j. **"Drawing"** means the drawing or drawings specified in or annexed to the specification;

k. The **"Employer"** or **"BMRCL"** means the Bangalore Metro Rail Corporation Limited or the person named as such in the Tender document and includes the legal successors or permitted assigns of the Employer,

l. **"Engineer"** means any person/party nominated or appointed from time to time by the Employer to act as the Engineer for the purposes of the Contract and notified as such in writing to the Contractor.

m. **"Engineer's representative"** means any person nominated by Engineer with the approval of the Employer who shall exercise the authority of the Engineer to the extent notified by the Engineer.

n. **"Equipment"** is the Contractor's machinery and vehicles brought temporarily to the Site to construct/ execute the Works.

o. The **"Initial Contract price"** is the Contract Price listed in the Employer's Letter of Acceptance.

p. **"Letter of Acceptance"** means the letter or memorandum communicating to the Successful Tenderer the acceptance of his Tender and includes other communication modes included in the Instructions to Tenderers.

q. **"Materials"** are all supplies, including consumables, used by the Contractor for incorporation in the Works.

r. **"Notice to Proceed"** means the notice issued by the Employer to the Contractor to proceed with the works at the site.

s. **"Plant"** is any integral part of the Works which is to have a mechanical, electrical, electronic or chemical or biological function.

t. The **"Project Site"** or **"Site"** means the place specified in the Contract at which any work is required to be executed by the Contractor under the Contract or any other place approved by the Employer for the purpose.

u. **"Appendix to Form of Tender"** is the Salient Features of Contract that defines the documents and other information which comprise the Contract.

v. **"Signed"** includes stamped, except in the case of acceptance of Tender or any amendment thereof;

w. **"Specification"** means the Specification of the Works included in the Contract and any modification or addition made or approved by the Employer.

x. The **"Start Date"** shall be the date of issue of 'Letter of Acceptance' (LOA) or the date specified in the 'Notice to Proceed', as the case may be.

y. The **"Stipulated Completion Date"** is the date on which it is intended that the Contractor shall complete the Works. The Stipulated Completion Date is specified in the 'Appendix to Form of Tender'. The Stipulated Completion Date may be revised only by the Employer by issuing an extension of time.

z. A **"Subcontractor"** is a person or corporate body who has a Contract with the Contractor to carry out a part of the work in the Contract which includes work on the Site.

aa. A **"Variation"** is an instruction given by the Employer which varies the Works.

bb. **"Works"** means all the work specified or set forth and required in and by the said specifications, drawings and "schedule of Requirement", hereto annexed or to be implied there from or incidental thereto or to be hereafter specified or required in such explanatory instructions and drawings (being in conformity with the said original specifications, drawings and "Schedule of Requirement") and also in such additional instructions and drawings not being in conformity as aforesaid, as shall from time to time during the progress of the work hereby contracted for, be supplied by the Employer.

2. Interpretation

2.1 In interpreting these General Conditions of Contract and Special Conditions of Contract, singular also means plural, male also means female or neuter, and the other way around. Headings have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. “Tender” / “Tendering” / “Tenderer” shall also mean “Bid” / “Bidding” / “Bidder”. "Offer" also mean Tender / Bid.

2.2 The documents forming the Contract shall be interpreted in the following order of priority:

(1) Contract Agreement
(2) Letter of Acceptance,
(3) Priced Bill of quantities
(4) Technical Specifications
(5) Drawings
(6) Special Conditions of Contract
(7) General Conditions of Contract
(8) Contractor’s Proposal and
(9) Any other document listed as forming part of the Contract.

3. Law governing Contract

3.1 The law governing the Contract is the Laws of India supplanted by the Karnataka Local Acts.

4. Employer's decisions

4.1 Except where otherwise specifically stated, the Employer will decide contractual matters between the Employer and the Contractor.

5. Delegation

5.1 The Employer may delegate any of his duties and responsibilities to other people after notifying the Contractor and may cancel any delegation after notifying the Contractor.

6. Communications

6.1 Communications between parties which are referred to in the conditions are effective only when in writing. A notice shall be effective only when it is delivered (in terms of Indian Contract Act).

7. Not Used

8. Other Contractors

8.1 The Contractor shall cooperate and share the Site with other Contractors, public authorities, utilities, and the Employer.

9. Personnel

9.1 The Contractor shall, unless otherwise provided in the Contract, make his own arrangements for the engagement of all staff and labour, local or other, and for their payment, housing, feeding and transport.

9.2 The Contractor shall employ the technical personnel (of number and qualifications) as may be stipulated by BMRCL from time to time during the execution of the work. The technical staff so employed shall be available at site as may be stipulated by the Employer.

9.3 If the Employer asks the Contractor to remove a person who is a member of the Contractor’s staff or his work force stating the reasons, the Contractor shall ensure that the person leaves the Site within seven days and has no further connection with the work in the Contract.

9.4 **Compliance with Labour Regulations**

9.4.1 The Contractor shall, if required by the Employer, deliver to the Employer a return in detail, in such form and at such intervals as the Employer may prescribe, showing the staff and the numbers of the several classes of labour from time to time employed by the Contractor on the Site and such other information as the Employer may require.

10. Employer's and Contractor's risks

10.1 The Employer carries the risks which this Contract states are Employer's risks, and the Contractor carries the risks which this Contract states are Contractor's risks.

11. Employer's risks

11.1 The Employer is responsible for the excepted risks which are:
(a) rebellion, riot commotion or disorder unless solely restricted to employees of the Contractor or his Subcontractors arising from the conduct of the Works; or
(b) a cause due solely to the design of the Works, other than the Contractor's design; or
(c) any operation of the forces of nature (in so far as it occurs on the Site) which an experienced Contractor:
(i) could not have reasonably foreseen; or
(ii) could reasonably have foreseen, but against which he could not reasonably have taken at least one of the following measures;
(A) prevent loss or damage to physical property from occurring by taking appropriate measures or
(B) insure against such loss or damage.

12. Contractor's risks

12.1 All risks of loss of or damage to physical property and of personal injury and death which arise during and in consequence of the performance of the Contract other than the excepted risks are the responsibility of the Contractor.

13. Not used

14. Contractor to execute the Works

14.1 The Contractor shall execute the Works in accordance with the Specification and Drawings.

15. The Works to be completed by the Stipulated Completion Date

15.1 The Contractor may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the program submitted by the Contractor, as updated with the approval of the Employer, and complete them by the Stipulated Completion Date.

16. Safety

16.1 The Contractor shall be responsible for the safety of all activities on the Site.

17. Discoveries

17.1 Anything of historical or other interest or of significant value unexpectedly discovered on the Site is the property of the Employer. The Contractor is to notify the Employer of such discoveries and carry out the Employer's instructions for dealing with them.

18. Possession of the Site

18.1 The Employer shall give possession of all parts of the Site to the Contractor. If possession of site or a part of site is not given by the date stated in the Contract or Notice to proceed, the

reasonable extension of time may be given. However, no monetary claims whatsoever shall be paid to the Contractor or entertained on this account.

19. Access to the Site

19.1 The Contractor shall allow the Employer and any person authorized by the Employer access to the Site, to any place where work in connection with the Contract is being carried out or is intended to be carried out and to any place where materials or plant are being manufactured / fabricated / assembled for the works.

20. Instructions

20.1 The Contractor shall carry out all instructions of the Employer which comply with the applicable laws, where the Site is located.

B. Time Control

21. Program

21.1 Within the time stated in the 'Appendix to Form of Tender', the Contractor shall submit to the Employer for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the Works.

21.2 The Employer's approval of the Program shall not alter the Contractor's obligations. The Contractor may revise the Program and submit it to the Employer again at any time. A revised Program is to show the effect of Variations.

22. Extension of the Time for Completion

22.1 The Employer shall extend the Time for Completion of the works if a Variation is issued and which makes it impossible for Completion to be achieved by the Stipulated Completion Date.

22.2 The Employer shall decide whether and by how much to extend the Stipulated Completion Date within 21 days of the Contractor asking the Employer for a decision upon the effect of a Variation and submitting full supporting information.

23. Delay ordered by the Employer

23.1 The Employer may instruct the Contractor to delay the start or progress of any activity within the Works. However, no monetary claims whatsoever shall be paid to the Contractor or entertained on this account.

24. Management meetings

24.1 The Employer may require the Contractor to attend a Management meeting. The business of a Management meeting shall be to review the progress achieved and the plans for remaining work.

24.2 The responsibility of the parties for actions to be taken is to be decided by the Employer either at the Management meeting or after the management meeting and stated in writing to be distributed to all who attended the meeting.

25. Performance Security / Security Deposit

25.1 Within 20 days of receipt of notification communicated by the Employer by issue of "Letter of Acceptance", the Contractor shall furnish a Performance Security (including additional security

for unbalanced Tenders, if required) for an amount as specified in **Appendix to Form of Tender (Section 4)** in one of the following forms:

(a) A crossed Demand Draft / Pay Order / Banker's cheque in favour of the "**Bangalore Metro Rail Corporation Ltd**" from an Indian Scheduled Bank (excluding Cooperative Banks) or from a Scheduled Foreign Bank as defined in Section 2(e) of RBI Act 1934 read with Second Schedule, **payable at Bangalore**.

or

(b) An irrevocable Bank Guarantee/ e-BG issued from an Indian Scheduled Bank (excluding Cooperative Banks) or from a Scheduled Foreign Bank as defined in Section 2(e) of RBI Act 1934 read with Second Schedule drawn on and **payable & extendable at a designated branch in Bangalore** *(specify the name of the branch and address)* in the Form given in **Proforma B of Section 9** to the Tender documents. However, 'Performance Security' Bank Guarantee format is also available in http://tender.bmrc.co.in

In case furnishing of an acceptable Performance Security is delayed by the Contractor beyond the period provided in GCC clause 25.1, the Employer may forfeit the Earnest Money Deposit.

25.2 On the performance and completion of the Contract in all respects the Performance Security will be converted into Guarantee to warrant the Defect Liability obligations of the Contractor. The Performance Security shall be valid up to 3 months beyond the Defects Liability Period for the Entire Work and the additional security for unbalanced Tenders shall be valid until a date 30 days from the date of issue of the certificate of completion. The Performance Security will be returned within 3 months after satisfactory completion of Defects Liability Period.

25.3 The Employer shall be entitled and it shall be lawful on his part to forfeit the amount of the Performance Security in whole or in part in the event of any default, failure or neglect on the part of the Contractor in the fulfilment or performance in all respects of the Contract under reference or any other Contract with the Employer.

The Employer shall also be entitled to deduct from the amount of the Performance Security any loss or damage which the Employer may suffer or be put by reason of or due to any act or other default, recoverable by the Employer from the Contractor in respect of the Contract under reference or any other Contract

On occurrence of either of the events aforesaid to call upon the Contractor to maintain the amount of the Performance Security as its original limit by furnishing fresh Bank Guarantee/ e-BG of additional amount, provided further that the Employer shall be entitled to recover any such claim from any sum then due or which at any time thereafter may become due to the Contractor under this or any other Contracts with the Employer.

25.4 The Performance Security shall remain in full force and effect during the period that would be taken for satisfactory performance/ completion of the Works and fulfilment in all respects of the Contract and shall in the first instance be valid until 3 months beyond Defects Liability Period. Before the expiry of the date of validity of the Performance Security, the Contractor on being called upon by the Employer from time to time shall obtain from the Guarantee Bank, extension of time for validity thereof for a period of six months, on each occasion. The extension or extensions aforesaid, executed on non-judicial stamp paper of appropriate value must reach the Employer at least thirty days before the date of expiry of the Performance Security on each occasion.

25.5 As and when an amendment is issued to the Contract, the Contractor shall, within 15 days of the receipt of such an amendment furnish to the Employer an amendment to the Performance Security rendering the same valid for the Contract as amended and up to 3 months beyond amended completion of Defects Liability Period. All expenses of this shall be borne by the Contractor.

25.6 The Performance Security and or any amendment thereto shall be executed on a Non Judicial stamp paper of requisite money value in accordance with the laws of the country in which the same is/are executed by the party competent to do so.

25.7 If the Contractor, having been called upon by the Employer to furnish Performance Security, fails to furnish the same, it shall be lawful for the Employer:

i) To recover from the Contractor, the amount of Performance Security by deducting the amount from the pending bills of the Contractor under any Contract with the Employer or the government or any other person contracting through the Employer or otherwise however, OR
ii) To cancel the Contract or any part thereof and to execute or authorize to execution of the Works at the risk and cost of the Contractor and in that event the provisions of clause 46 & 47 shall apply as far as applicable.

26. Insurance

26.1 The Contractor shall prior to commencing the works, effect and thereafter maintain insurances, in the joint names of the Employer and the Contractor, (cover from the first working day after the Start Date to the end of Defects Liability Period), in the amounts stated in the 'Appendix to Form of Tender':
(a) For loss of or damage to the Works, Plants and Materials and the Contractor's equipment;
(b) For liability of both Parties for loss, damage, death and injury to third parties or their property arising out of the Contractor's performance of the Contract including the Contractor's liability for damage to the Employer's property other than the Works and
(c) For liability of both Parties and of any Employer's representative for death and injury to the Contractor's personnel except to the extent that liability arises from the negligence of the Employer, any Employer's representative or their Employees.

26.2 Policies and certificates for insurance shall be delivered by the Contractor to the Employer for his approval before the Start Date. All such insurance shall provide for compensation to be payable to rectify the loss or damage incurred. All payments received from insurers relating to loss or damage shall be held jointly by the Parties and used for the repair of the loss or damage or as compensation for loss or damage that is not to be repaired.

26.3 If the Contractor fails to effect or keep in force any of the insurances referred to in the previous sub- clauses or fails to provide satisfactory evidence, policies or receipts, the Employer may without prejudice to any other right or remedy, effect insurance for the cover relevant to such default and pay the premiums due and recover the same as a deduction from any other monies due to the Contractor. If no payment is due, the payment of the premiums shall be a debt due.

26.4 Alterations to the terms of insurance shall not be made without the approval of the Employer.

26.5 Both Parties shall comply with any conditions of the insurance policies.

C. Quality Control

27. Identifying defects

27.1 The Employer shall check the Contractor's work and notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor's responsibilities. The Employer may instruct the Contractor to search for a Defect and to uncover and test any work that the Employer considers may have a Defect.

28. Tests

28.1 If the Employer instructs the Contractor to carry out a test not specified in the Specification to check whether any work has a Defect and the test shows that it has a defect, the Contractor shall pay for the test and any samples. If there is no defect, the testing charges shall be borne by the Employer.

29. Correction of Defects

29.1 The Employer shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion and is defined in the 'Appendix to Form of Tender'. The Defects Liability Period shall be extended for as long as Defects remain to be corrected.

29.2 Every time notice of a Defect is given, the Contractor shall correct the notified Defect within the length of time specified by the Employer's notice.

30. Uncorrected defects

30.1 If the Contractor has not corrected a Defect within the time specified in the Employer's notice, the Employer will assess the cost of having the Defect corrected, and the Contractor will pay this amount or will be recovered from any amount due to the Contractor from the Employer including Performance Security.

31. Inspections and Tests

31.1 The Employer or its representative shall have the right to inspect and/or to test the materials or works to confirm their conformity to the Contract specifications at no extra cost to the Employer. Special Conditions of Contract and the Technical Specifications shall specify what inspections and tests the Employer requires and where they are to be conducted. The Employer shall notify the Contractor in writing in a timely manner of the identity of any representatives retained for these purposes.

31.2 Should any inspected or tested materials fail to conform to the specifications, the Employer may reject the materials or Works and the Contractor shall either replace the rejected materials or make alterations /rectifications necessary to meet specification requirements free of cost to the Employer.

31.3 The Employer's right to inspect test and where necessary, reject the materials or Works at Project Site shall in no way be limited or waived by reason of the materials or Works having previously been inspected, tested and passed by the Employer or its representative prior to the dispatch of the materials.

31.4 Nothing in GCC Clause 31 shall in any way release the Contractor from any warranty or other obligations under this Contract.

32. Acceptance Certificates:

On successful completion of acceptability test, receipt of deliverables etc, and after the Employer is satisfied with the completion of the Works, the Acceptance Certificate signed by the Contractor and the representative of the Employer will be issued. The date on which such certificate is signed shall be deemed to be the date of successful acceptance of the Works.

D. Cost Control

33. Bill of Quantities (BOQ)

33.1 The BOQ shall contain items for the construction/Works including installation, testing, and commissioning work (if any) to be done by the Contractor.

33.2 The BOQ is used to calculate the Contract Price. The Contractor is paid for the quantity of the work done at the rate in the BOQ for each item.

34. Variations

34.1 The Employer shall have power to order the Contractor to do any or all of the following as considered necessary or advisable during the progress of the work by him
(a) Increase or decrease of any item of work included in the Bill of Quantities (BOQ);
(b) Omit any item of work;
(c) Change the character or quality or kind of any item of work;
(d) Change the levels, lines, positions and dimensions of any part of the work;
(e) Execute additional items of work of any kind necessary for the completion of the works; and
(f) Change in any specified sequence, methods or timing of construction of any part of the work.

34.2 The Contractor shall be bound to carry out the work in accordance with any instructions in this connection, which may be given to him in writing by the Employer and such alteration shall not vitiate or invalidate the Contract.

34.3 Variations shall not be made by the Contractor without an order in writing by the Employer, provided that no order in writing shall be required for increase or decrease in the quantity of an item appearing in the BOQ so long as the work executed conforms to the approved drawings.

34.4 The Contractor shall not make any alteration and/or modification of the Works, unless and until the Engineer instructs or gives consent to a Variation.

If the Construction and/or Manufacture Documents or Works are not in accordance with the Contract, the rectification shall not constitute a Variation.

35. Payments for Variations

35.1 Payment for increase in the quantities of an item in the BOQ up to 25% of that provided in the Bill of Quantities shall be made at the rates quoted by the Contractor.

35.2 For quantities in excess of 125% of the tendered quantity of an item as given in the BOQ, the Contractor shall be paid at the rate entered in or derived from the Schedule of Rates (applicable for the area of the work and current at the time of award of contract) plus or minus the overall percentage of the original tendered rates over the current Schedule of Rates prevalent at the time of award of Contract.

35.3 If there is no rate for the additional, substituted or altered item of the work in the BOQ, efforts would be made to derive the rates from those given in the BOQ or the Schedule of Rates (applicable for the area of the work and current at the time of award of Contract) and if found

feasible the payment would be made at the derived rate for the item plus or minus the overall percentage of the original tendered rates over the current Schedule of Rates prevalent at the time of award of Contract.

35.4 If the rates for additional, substituted or altered item of work cannot be determined either as at 35.1, 35.2 or 35.3 above, the Contractor shall be requested to submit his quotation for the items supported by analysis of the rate or rates claimed, within 7 days.

35.5 If the Contractor's quotation is determined unreasonable, the Employer may order the Variation and make a change to the Contract Price which shall be based on Employer's own forecast of the effects of the Variation on the Contractor's costs.

35.6 If the Employer decides that the urgency of varying the work would prevent a quotation being given and considered without delaying the work, no quotation shall be given and the Variation shall be treated as a Compensation Event.

35.7 Under no circumstances the Contractor shall suspend the work on the plea of non-settlement of rates for items falling under this Clause.

36. Submission of bills for payment

36.1 The Contractor shall submit to the Employer monthly bills of the value of the work completed less the cumulative amount paid previously.

36.2 The Employer shall check the Contractor's bill and determine the value of the work executed which shall comprise of;

(i) Value of the quantities of the items in the BOQ completed and
(ii) Valuation of Variations.

36.3 The Employer may exclude any item paid in a previous bill or reduce the proportion of any item previously paid in the light of later information.

37. Payments

37.1 Payments shall be adjusted for deductions for advance payments, if any, other recoveries in terms of Contract and taxes, at source, as applicable under the law. The Employer shall pay the Contractor within 60 days of submission of complete and valid Bill without any deficiency. The Contractor shall be liable to pay liquidated damages for shortfall in progress.

37.2 Items of the Works for which no rate or price has been entered in will not be paid for by the Employer and shall be deemed covered by other rates and prices in the Contract.

37.3 BMRCL has registered itself in TReDS platform for acceptance of contractor's bills (factor unit), in case the contractor opts for the same.

38. Not Used

39. Taxes & Duties

39.1 The Contract Price quoted by the Contractor shall be in accordance with the respective Special Conditions of the Contract and the Employer will perform such duties in regard to the deduction of taxes at source as per applicable law.

39.2 **Taxes & Duties:**

39.2.1 The Contract Price shall be the complete requirement of the Works specified on a single responsibility basis.

39.2.2 This is a Works Contract:

a. The Contract price shall be inclusive of all applicable taxes, duties and Cess but exclusive of CGST and SGST. The supplier shall include all applicable taxes and duties under the applicable acts in the contract price excluding the CGST and SGCT. BMRCL will pay the output CGST and SGST on value of supplies/works done as invoiced by the contractor, at rates as per applicable Law.
b. In case of import, it should be done against Contractor's Import License. Custom Duty, Port handling and associated expenses shall be included in the Contract price in Indian Rupees.

39.2.3 Income tax and other statutory deductions of the State & Central Government as applicable from time to time shall be made from the Contractor's Bills & directly remitted to concerned department by BMRCL. If the income tax is to be deducted at lower rate, then the Contractor has to furnish a lower deduction certificate issued by the jurisdictional IT authorities.

39.2.4 The Contractor shall maintain complete records in respect of payments made by them as required by Law. The Contractor shall furnish along with the 2nd and subsequent bills copies of all the purchases of Goods and Services made within the State of Karnataka.

40. Liquidated damages

40.1 The Contractor shall pay liquidated damages to the Employer at the rate per day stated in the 'Appendix to Form of Tender' for each day that the Completion Date is later than the Stipulated Completion Date (for the whole of the Works or the milestone as stated in the 'Appendix to Form of Tender'). The total amount of liquidated damages shall not exceed the amount defined in the 'Appendix to Form of Tender'. The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages does not affect the Contractor's liabilities.

40.2 If the Stipulated Completion Date is extended after liquidated damages have been paid, the Employer shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment of bill.

41. Cost of repairs

41.1 Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the Defects Liability Period shall be remedied by the Contractor at the Contractor's cost if the loss or damage arises from the Contractor's acts or omissions.

E. Finishing the Contract

42. Completion

42.1 The Contractor shall request the Employer to issue a Certificate of Completion of the Works and the Employer will do so upon deciding that the Work is completed.

43. Taking over

43.1 The Employer shall take over the Site and the Works within seven days of issuing a Certificate of Completion.

44. Final Bill / Account

44.1 The Contractor shall supply to the Employer a detailed account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Employer shall issue a Defect Liability Certificate and certify any final payment that is due to the Contractor within 90 days of receiving the Contractor's final bill / account, if it is correct and complete. If it is not, the Employer shall issue within 90 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Bill / Account is still unsatisfactory after it has been resubmitted, the Employer shall decide on the amount payable to the Contractor and make payment within 60 days of receiving the Contractor's revised Final Bill / Account.

45. As built drawings

45.1 Where "as built" / "Completion" Drawings and /or "Operating and Maintenance Manuals" are required, the Contractor shall supply them by the dates stated in the 'Appendix to Form of Tender'.

45.2 If the Contractor does not supply the Drawings by the dates stated in the 'Appendix to Form of Tender', or they do not receive the Employer's approval, the Employer shall withhold the amount stated in the 'Appendix to Form of Tender' from payments due to the Contractor.

46. Termination

46.1 The Employer may terminate the Contract if the Contractor causes a fundamental breach of the Contract.

46.2 Fundamental breaches of Contract include, but shall not be limited to the following:

(a) The Contractor stops work for 45 days when no stoppage of work is shown on the current Program and the stoppage has not been authorized by the Employer;

(b) The Contractor becomes bankrupt or goes into liquidation other than for a reconstruction or amalgamation;

(c) The Employer gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within thirty (30) days of receipt of Notice of failure from BMRCL or within such further time period as BMRCL may have subsequently approved in writing;

(d) The Contractor does not maintain safety and security which is required;

(e) The Contractor has delayed the completion of works by the number of days for which the maximum amount of liquidated damages can be paid as defined in the 'Appendix to Form of Tender'; and

(f) If the Contractor, in the judgment of the Employer has engaged in corrupt or fraudulent practices in competing for or in the executing the Contract.

For the purpose of this paragraph:

1. "corrupt practice" means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in Contract execution.

2. "Fraudulent practice" means any omission a misrepresentation of facts in order to influence a procurement process or the execution of a Contract to the

detriment of the Borrower, and includes collusive practice among Tenderers (prior to or after Tender submission) designed to establish Tender prices at artificial non-competitive levels and to deprive the Borrower of the benefits of free and open competition."

46.3 When either party to the Contract gives notice of a breach of Contract to the Employer for a cause other than those listed under Sub Clause 46.2 above, the Employer shall decide whether the breach is fundamental or not.

46.4 Notwithstanding the above, the Employer may terminate the Contract for convenience.

46.5 If the Contract is terminated, the Contractor shall stop work immediately, make the Site safe and secure and leave the Site as soon as reasonably possible.

47. Payment upon Termination

47.1 If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Employer shall prepare bill for the value of the work done less advance payments received up to the date of the bill, less other recoveries due in terms of the Contract, less taxes due to be deducted at source as per applicable law and less the percentage to apply to the work not completed as indicated in the 'Appendix to Form of Tender'. Additional Liquidated Damages shall not apply. If the total amount due to the Employer exceeds any payment due to the Contractor, the difference shall be a debt payable to the Employer.

47.2 If the Contract is terminated at the Employer's convenience or because of a fundamental breach of Contract by the Employer, the Employer shall prepare bill for the value of the work done, the reasonable cost of removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works and less advance payments received up to the date of the certificate, less other recoveries due in terms of the Contract, and less taxes due to be deducted at source as per applicable law and make payment accordingly.

48. Property

48.1 All materials on the Site, Plant, Equipment, Temporary Works and Works are deemed to be the property of the Employer, if the Contract is terminated because of a Contractor's default.

49. Release from performance

49.1 If the Contract is frustrated by any event entirely outside the control of either the Employer or the Contractor, the Employer shall certify that the Contract has been frustrated. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterwards to which commitment was made.

F. OTHERS

50. Warranty / Defects Liability Period

50.1 The Contractor warrants that all Works executed under this Contract shall have no defect arising from materials or workmanship (except when the material is required by the Employer's Specifications) or from any act or omission of the Contractor, that may develop under normal use of the supplied materials or the Works in the conditions prevailing in the country of final destination.

50.2 This Warranty shall remain valid for a period specified in Appendix to Form of Tender after the materials or Works or any portion thereof as the case may be, have been delivered to and accepted at the final destination indicated in the Contract. The Contractor shall, in addition, comply with the performance and/or consumption guarantees specified under the Contract. If for reasons attributable to the Contractor, these guarantees are not attained in whole or in part, the Contractor shall at its discretion either:

a) Make such changes, modifications, and/or additions to the Works or any part thereof as may be necessary in order to attain the contractual guarantees specified in the Contract at its own cost and expense and to carry out further Performance Tests in accordance to respective Special Conditions of Contract/Technical Specification. OR

b) Pay liquidated damages to the Employer with respect to the failure to meet the contractual guarantees. The rate of these liquidated damages shall be as per GCC clause 40 or respective Special Conditions of Contract or as specified in the Technical Specifications.

50.3 The Employer shall promptly notify the Contractor in writing of any claims arising under this warranty.

50.4 Upon receipt of such notice, the Contractor shall, within the period of 3 days and with all reasonable speed, repair or replace the defective Works or parts thereof, free of cost at the ultimate destination. In the event of any correction of defects or replacement of defective material during the Warranty period, the Warranty for the corrected or replaced material shall be extended to a further period from the date of replacement/repair/renewal.

50.5 If the Contractor, having been notified, fails to remedy the defect(s) within 3 days, the Employer may proceed to take such remedial action as may be necessary, at the Contractor's risk and expense and without prejudice to any other rights which the Employer may have against the Contractor under the Contract.

51. Force Majeure

51.1 Notwithstanding the provisions of GCC Clauses 21, 22, 23, the Contractor shall not be liable forfeiture of its Performance Security, liquidated damages or termination for default, if and to the extent that, its delay in performance or other failure to perform its obligations under the Contract is the result of an event of Force Majeure.

51.2 For purposes of this Clause, "Force Majeure" means an event beyond the control of the Contractor and not involving the Contractor's fault or negligence and not foreseeable. Such events may include, but are not limited to, acts of the Employer either in its sovereign or contractual capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions and freight embargoes.

51.3 If a Force Majeure situation arises, the Contractor shall promptly notify the Employer in writing of such conditions and the cause thereof. Unless otherwise directed by the Employer in writing, the Contractor shall continue to perform its obligations under the Contract as far as is reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the Force Majeure event.

52. Procedure for Resolution of Disputes

52.1 The Employer and the Contractor shall make every effort to resolve amicably through negotiation any disagreement or dispute arising between them under or in connection with the Contract.

52.2 If the Contractor is not satisfied with the decision taken by the Employer, the dispute shall be referred by either party to Arbitration within 30 days of the notification of the Employer's decision.

52.3 If neither party refers the dispute to Arbitration within the above 30 days, the Employer's decision will be final and binding.

52.4 The Arbitration shall be conducted in accordance with the arbitration procedure stated in the respective Special Conditions of Contract.

53. Patent Rights

53.1 The Contractor shall indemnify the Employer against all third-party claims of infringement of Intellectual Property rights of patent, trademark or industrial design rights arising from use of the materials or design or data or any part thereof in India.

54. Limitation of Liability

54.1 Except in cases of criminal negligence or wilful misconduct, and in the case of infringement pursuant to GCC Clause 53,

a) The Contractor shall not be liable to the Employer, whether in Contract, tort, or otherwise, for any indirect or consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs, provided that this exclusion shall not apply to any obligation of the Contractor to pay liquidated damages to the Employer; and

b) The aggregate liability of the Contractor to the Employer, whether under the Contract, in tort or otherwise, shall not exceed the total Contract Price, provided that this limitation shall not apply to the cost of repairing or replacing defective works / equipment.

55. Governing Language

55.1 The Contract shall be written in English language. Subject to GCC Clause 3, English language version of the Contract shall govern its interpretation. All correspondence and other documents pertaining to the Contract, which are exchanged by the parties, shall be written in the same language.

56. The Courts of Jurisdiction

56.1 Any suit or application, arising out of any dispute or difference on account of this Tender shall be filed in a competent court at Bangalore, Karnataka only and no other court or any other district of the country shall have any jurisdiction in the matter.

57. Notices

57.1 Any notice given by one party to the other pursuant to this Contract shall be sent to other party in writing or by facsimile or cable or telex or by hand (duly acknowledged) and confirmed in writing to the other Party's address specified in Special Conditions of Contract.

58. Use of Contract Documents and Information; Inspection and Audit by the Government

58.1 The Contractor shall not, without the Employer's prior written consent, disclose the Contract, or any provision thereof, or any specification, plan, drawing, pattern, sample or information furnished by or on behalf of the Employer in connection therewith, to any person other than a person employed by the Contractor in performance of the Contract. Disclosure to any such employed person shall be made in confidence and shall extend only so far as may be necessary for purposes of such performance.

58.2 The Contractor shall not, without the Employer's prior written consent, make use of any document or information enumerated in GCC Clause 58.1 except for purposes of performing the Contract.

58.3 Any document, other than the Contract itself, enumerated in GCC Clause 58.1 shall remain the property of the Employer and shall be returned (in all copies) to the Employer on completion of the Contractor's performance under the Contract if so required by the Employer.

58.4 The Contractor shall permit BMRCL to inspect the Contractor's accounts and records relating to the performance of the Contractor and to have them audited by Auditors appointed by the BMRCL, if so required by BMRCL.

59. Site Investigation Reports

59.1 The Contractor, in preparing the Tender, shall rely on any site investigation reports referred to in the 'Appendix to Form of Tender', supplemented by any information available to the Tenderer.

60. Approval by the Employer

60.1 The Contractor shall submit Specification and drawings showing the proposed Temporary Works to the Employer, who is to approve them if they comply with the Specifications and Drawings.

60.2 The Contractor shall be responsible for the design of Temporary Works

60.3 The Employer's approval shall not alter the Contractor's responsibility for design of the Temporary Works.

60.4 The Contractor shall obtain approval of third parties to the design of the temporary Works where required.

60.5 All Drawings prepared by the Contractor for the execution of the temporary or permanent Works, are subject to prior approval by the Employer before their use.

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SECTION 6: SPECIAL CONDITIONS OF CONTRACT

1. General

The following Special Conditions shall be read in conjunction with the Section 5: General Conditions of Contract including Amendments/ Corrigendum thereto. If any provision in these Special Conditions is at variance with that of the aforesaid documents, the later shall be deemed to take precedence there over.

2. Scope of Work / Inspection of Site

The Tender is percentage Tender. The cost of all the individual items shall be computed for the entire work and the Tender premium (plus or minus or at par) on the Total cost shall be quoted. The work under this Contract comprises of entire completion of the works described in the document and as specified in the Technical Specifications, Tenderer are advised to visit the Site(s) and ascertain for themselves the exact scope of work and its Working Conditions, viz. Working Hours, Availability of Site(s), availability of labour and materials and such other relevant conditions which effect the execution and the entire completion of the works etc. and quote their Tenders (Percentage) accordingly. Any claim whatsoever will not be entertained by the BMRCL at a later date. For the purpose of inspection of site, the Tenderer is advised to contact the Engineer who will give reasonable instructions / facilities thereof. The Tenderer shall be deemed to have inspected the site and its surrounding beforehand and taken into account all relevant factors pertaining to site in the preparation and submission of this Tender.

3. Subcontracting

Prior approval of the Employer shall be obtained before sub-contracting any part of the works. However, the Contractor shall not subcontract the whole of the Works.

4. Compliance with labour regulations (GCC Clause 9.4)

During continuance of the Contract, the Contractor and his sub-Contractors shall abide at all times by all existing labour enactments and rules made there under, regulations, notifications and bye laws of the State or Central Government or local authority and any other labour law (including rules), regulations, bye laws that may be passed or notification that may be issued under any labour law in future either by the State or the Central Government or the local authority. The Contractor shall keep the Employer indemnified in case any action is taken against the Employer by the competent authority on account of contravention of any of the provisions of any Act or rules made there under, regulations or notifications including amendments. If the Employer is caused to pay or reimburse, such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated in the notifications / bye laws / Acts / Rules / regulations including amendments, if any, on the part of the Contractor, Employer shall have the right to deduct any money due to the Contractor including his amount of Security Deposit. The Employer shall also have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Employer.

The employees of the Contractor and the Sub-Contractor in no case shall be treated as the employees of the Employer at any point of time.

5. Safety (GCC Clause 16)

Fire Precautions:

5.1 The Contractor, his agents, representative, workmen etc., shall strictly observe the orders pertaining to fire precautions prevailing within the restricted area.

5.2 Motor transport vehicles, if any allowed by the Engineer to enter the restricted area, must be fitted with serviceable fire extinguishers.

5.3 The Contractor shall strictly abide by the SHE manual provided in Section-11.

6. Access to the Site (GCC Clause 19)

Security and Passes:

6.1 Contractor's attention is invited to condition that, he shall employ only Indian Nationals after verifying their antecedent and loyalty. The Contractor shall, maintain list of his agents, employees and work people concerned and shall satisfy the Engineer as to the bonafides of such people, and submit to the Engineer / Employer on demand.

6.2 The Employer shall at his discretion have the right to issue passes as per rules and regulations of the installation, area in force to control the admission of the Contractor, his agent's employees and work people to the site of the work or any part thereof. Passes should be returned at any time on demand by the Engineer or the authorities concerned and, in any case on completion of work.

6.3 The Contractor and his agents, employees and workers shall observe all the Rules promulgated by the authority controlling the installation area in which the work is to be carried out. e.g. Prohibition of smoking and lighting, fire precautions, search of persons on entry and exit, keeping to specific route, observing specified timing, etc., nothing extra shall be admissible for any man hours, etc., lost on this account.

6.4 **Conditions of working in restricted area:**

Work under this Contract lies in restricted area.

6.4.1 **Visit to site within the restricted area**

Permission to enter the restricted areas at the time of submission of Tenders can be obtained through the Employer or his authorized Representative. Tenderers are advised to send prior intimation of their agents, representatives etc., if any, dates and time of their proposed visit so that necessary arrangements may be made by Employer to secure admission. Whether a Tenderer visits the site or not he shall be deemed to have full knowledge of the restriction of entering into/exit from and working within the restricted area.

6.4.2 **Entry/Exit**

The Contractor his agents/representatives, workmen etc., and his materials, carts, trucks or other means of transport etc., will be allowed to enter through and leave from only such gate or gates and such times as the employer or authorities in charge of the restricted areas may at their sole discretion permit to be used. The Contractor's authorized representatives are required to be present at the place of entry and exit for the purpose of identifying his carts, trucks etc., to the personnel in charge of the security of restricted areas.

6.4.3 **Identity Cards or Passes**

The Contractor, his agents and representatives are required individually to be in possession of an identity Card or Pass duly verified by the Employer or his authorized Representative. The identity

card or pass will be examined by the Security Staff at the time of entry into or exit from the Restricted Area and also at any time or number of times inside the Restricted Area.

6.4.4 **Identity of Workmen**

(i) Every workman shall be in possession of an identity card. The Identity Card will be issued after thorough investigation of the antecedents of the labourers by the Contractors and attested by Officer-in-Charge of the unit concerned in accordance with the Standing Rules and regulations of the units.

(ii) Contractor shall be responsible for the conduct and action of his workmen, agents or representatives.

6.4.5 **Search**

Thorough search of all persons and transport shall be carried out at each gate and for as many times as the gate is used for entry or exit and may also be carried out at any time or any number of times at the work site within the Restricted area.

6.4.6 **Work on Holidays**

(i) The Contractor shall not carry out any work on Gazetted Holidays/Weekly holidays and other non-working days except when he is specially authorized in writing to do so by the Engineer or his Representative. The Employer may at his sole discretion, declare any day as holiday or non-working day without assigning any reasons for such declaration.

(ii) The Contractor shall provide adequate lighting and safety arrangements when working on holidays. No increase in rates or additional payments shall be admissible for night work to the Contractor by the Employer.

6.4.7 **Access to restricted area after completion of Works**:-

After the works are completed and surplus stores etc. are removed, the Contractor, his agents, representatives or workmen etc., may not be allowed to have access to the restricted area except for attending any rectification of defects pointed out to him by the Engineer / Employer.

6.4.8 **Water**

Water will not be supplied by the BMRCL and Contractor shall make his own arrangement for water.

6.4.9 **Co-operation with other Agencies**

The Contractor shall permit free access and generally afford reasonable facilities to other agencies or departmental workmen engaged by the BMRCL to carry out their part the work, if any, under separate arrangements.

6.4.10 **Electric Supply**

Electricity shall be provided on chargeable basis considering the unit rate charged by BESCOM to BMRCL (i.e. based on the prevailing rate/s of BESCOM), if available and feasible. Otherwise, the Contractor shall make his own arrangements at his own cost, for Electrical Power and gas required for his works. Work shall not be delayed for non-availability of electricity/gas.

6.4.11 **Emergency Works**

If, by reason of an emergency arising in connection with and during the execution of the Contract, any protective or remedial work is necessary as a matter of urgency to prevent damage

to the Facilities, the Contractor shall immediately carry out such work, under intimation to the Engineer.

7. Inspections and Tests (GCC Clause 31)

7.1. **Inspections and tests at final acceptance are as follows:**

(i) The inspection of the materials / Works shall be carried out to check whether the materials / Works are in conformity with the Technical Specifications attached to the Contract and shall be in line with the inspection/test procedures laid down in the Technical Specifications and the General Conditions of Contract. Following broad test procedure will generally be followed for inspection and testing of works.

(ii) The acceptance test will be conducted by the Contractor in presence of the Employer/ Engineer / their representative or any other person nominated by the Employer / Engineer. The acceptance will involve trouble-free operation. There shall not be any additional charges for carrying out acceptance tests. No malfunction, partial or complete failure of the Works should occur.

(iii) In the event of the materials / Works failing to pass the acceptance test, a period not exceeding two weeks will be given to rectify the defects and clear the acceptance test, failing which the Employer reserves the rights to get the Works replaced / redone by the Contractor at no extra cost to the Employer.

7.2. **Materials and Samples**

7.2.1 The Contractor shall produce samples of all materials/articles, fittings, accessories etc., that he proposes to use in the Works and get it approved in writing by the Engineer before incorporating in the work. The materials, articles etc., as approved shall be labeled as such and shall be signed by the Engineer and Contractor's representative. The samples shall be kept in the custody of the Engineer till payment of final bill.

7.2.2 Materials provided by the Contractor for incorporation in the work shall unless otherwise specified in the Technical specifications, comply with the requirement of the latest relevant Indian Standard (IS) in the website of BIS i.e. www.bis.org.in and as specified in 'Karnataka Building Specifications (KBS)', 'Karnataka Roads & Bridges Specifications (KRBS)' and 'Karnataka Public Works Ports and Inland Water Transport Department (KPWP&IWTD)', Bangalore Circle. In case of any difference / discrepancy on the above, the condition in the interest of BMRCL shall prevail.

8. Variations (GCC Clause 34)

Total variation under the Contract shall be limited to ± 25% of the Total Original Value of the Contract.

9. Payments for Variations (GCC Clause 35)

Payments for variations shall be made in accordance to GCC Clause 35.

10. Taxes and Duties (GCC Clause 39)

10.1 The Contract Price shall be the complete requirement of the Works specified on a single responsibility basis.

10.2 This is a Works Contract:

a. The Contract price shall be inclusive of all applicable taxes, duties and Cess but exclusive of CGST and SGST. The Contractor shall include all applicable taxes, duties and Cess

under the applicable acts in the contract price excluding the CGST and SGCT. BMRCL will pay the output CGST and SGST.

b. The contractor shall ascertain all applicable Taxes and Duties under the applicable Acts and shall be included in the Contract price.

c. In case of import, it should be done against Contractor's Import License. Custom Duty, Port handling and associated expenses shall be included in the Contract price in Indian Rupees.

10.3 Income tax and other statutory deductions of the State & Central Government as applicable from time to time shall be made from the Contractor's Bills & directly remitted to concerned department by BMRCL. If the income tax is to be deducted at lower rate, then the Contractor has to furnish a lower deduction certificate issued by the jurisdictional IT authorities.

10.4 The Contractor shall maintain complete records in respect of payments made by them as required by law. The Contractor shall furnish along with the 2nd and subsequent bills copies of all the purchases of Goods and Services made within the State of Karnataka

10.5 The Contract Price shall be inclusive of all charges of insurance, transportation up to destination, handling, installation, royalties & any other charges leviable and payable by the Contractor under the Contract, or for any other cause and including Tax to be deducted at source and shall be included in the Total Tender Price.

10.6 Contractors shall be entirely responsible for license fees, road permits, and any other incidentals etc., incurred until completion of the whole of the Works and handover to the Employer.

10.7 The successful Tenderer shall maintain complete records of duties, other taxes and levies, etc; payable to various authorities in relation to the Works and submit the receipts/records for verification as and when demanded in writing by the Employer.

10.8 Any increase in SGST & CGST shall not be paid in the extended period of Contract for which the Contractor alone is responsible for delay as determined by the Engineer while granting the extension of time". However, this shall not be applicable for "Variations".

11. Termination (GCC Clause 46)

11.1 The Fundamental breach of the Contract shall also include that "the Contractor has contravened SCC Clause 3 (Subcontracting) and GCC Clause 9 (Personnel).

11.2 In the event the Employer terminates the Contract in whole or in part, pursuant to GCC Clause 46, the Employer;

(i) Shall forfeit the performance Security, and

(ii) May carry out the Works, upon such terms and in such manner as it deems appropriate, works similar to those incomplete, and the Contractor shall be liable to the Employer for any excess costs for such similar Works. However, the Contractor shall continue the performance of the Contract to the extent not terminated.

12. Procedure for Resolution of Disputes (GCC Clause 52)

Arbitration:

The procedure for arbitration shall be as follows:

12.1 In case of dispute or difference arising between the Employer and the Contractor relating to any matter arising out of or connected with this agreement it shall be settled in accordance with the Arbitration and Conciliation Act 1996 and its latest amendments. The disputes or differences shall be referred to a Sole Arbitrator. The Sole Arbitrator shall be appointed by agreement between the parties; failing such agreement, a request may be made by BMRCL to the High Court of Karnataka to take necessary measure for appointment of the Sole Arbitrator.

12.2 Arbitration proceedings shall be held at Bangalore, Karnataka, India.

12.3 The cost and expenses of arbitration proceedings will be paid as determined by the Arbitrator. However, the expenses incurred by each party in connection with the preparation, presentation, etc., shall be borne by each party itself.

12.4 Performance under the Contract shall continue during the arbitration proceedings and payments due the Contractor by the Employer shall not be withheld, unless they are the subject matter of the arbitration proceedings.

13. Notices (GCC Clause 57)

For the purpose of all notices, the following shall be the address of the Employer and Contractor.

Employer*:*

BANGALORE METRO RAIL CORPORATION LIMITED (BMRCL)
III FLOOR BMTC COMPLEX,
K.H. ROAD, SHANTHINAGAR
BANGALORE- 560027.
KARNATAKA, INDIA.

Contractor:

……
(To be filled in after the award of Contract).

14. Use of Contract Documents and Information; Inspection and Audit by the Government (GCC Clause 58)

14.1 **Security of Classified Documents:**

The Contractor shall not communicate any classified information regarding work to others without prior approval of Engineer. The Contractor shall also not make copies of the design/drawings and other documents furnished to him in respect of works and he shall return all documents after completion of works or on earlier determination of Contract. The Contractor shall along with final bill, attach a receipt from the Engineer in respect of his having returned the classified documents as per condition of General Conditions of Contract.

15. Protection of Environment: (New Clause)

15.1 The Contractor shall take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation. During continuance of the Contract, the Contractor and his subcontractors shall abide at all times by all existing enactments on environmental protection and rules made there under, regulations, notifications and bye-laws of the State or Central Government, or local authorities and any other

law, bye-law, regulations that may be passed or notification that may be issued in this respect in future by the State or Central Government or the local authority.

16. Approved Materials (New Clause)

16.1 The Contractor shall obtain approved materials from manufacturers authorized stockiest where such authorized stockiest have been appointed. The Contractor shall produce original receipt voucher of the same.

16.2 The Contractor shall ensure that approved materials are brought to site in original sealed containers/packing, without breaking manufacturer's markings.

17. Casting Yard

17.1 The Casting Yard of the said work shall be within the vicinity of Recah-6 Section (i.e. within 20Kms).

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SECTION 7 – TECHNICAL SPECIFICATIONS

Scope of work:

The scope of work 'manufacture, supply and fixing in position including finishing of cement concrete (with 53 grade OP cement) precast cable troughs of M40 grade with twin and single cell using TMT reinforcement/mild steel bars with precast cement concrete cover slab for stations, viaducts, crossover locations and jumper locations etc. for traction, signal and telecom cable arrangements for extensions of Reach-5 (New line) of Phase-II.

The work mainly comprises of casting of precast cement concrete cable troughs of M40 grade including cover slab, curing, transporting from contractor's casting premises to BMRCL sites/stacking areas, (note: the cost shall be inclusive of the cost of moulds, providing cutouts, insets where specified, curing arrangement as required, all handling, transportation, loading, unloading, consumables etc. complete) Reinforcement shall be paid separately. rate shall include the cost of required dosage of admixture in concrete for obtaining required workability as per specifications and approval of Engineer. the detailed specifications of all these items are explained in BOQ and in technical specifications.

Before carrying out the work at site, necessary permissions from various local agencies/authorities/road authorities such as BBMP, PWD, Traffic Police etc. shall be required to be obtained by the contractor. The employer shall assist only by way of issue of necessary support letters.

Site clearance and dismantling of obstructions before commencement of work have to be done by the contractor.

The contractor shall carryout the work in such a manner as to cause least inconvenience to road users. necessary barricading, diversion boards with reflective paints, traffic lights, signage, fencing, blinker, night lamps etc. and other requirements for safe working as approved by the Engineer's representative shall be provided and maintained throughout the work site to the entire satisfaction of the Engineers representative.

Casting yard- the contractor has to establish his own casting yard with all the required facilities such as power supply, water supply, concrete mixing plant, casting beds, moulds, vibrators, men and machineries including all materials etc. complete. BMRCL will not pay separately for any of these items.

The contractor shall complete all the works within 08 months from the date of Notice To Proceed (NTP).

1. GENERAL

1.1 General

1.1.1 These Specifications contained herein shall be read in conjunction with other tender documents.

Generally, the work shall be carried out as per the latest edition of CPWD/KPWD specifications and "Specifications for Road and Bridge works" of Ministry of Road Transport & Highways (MORTH) as published by Indian Roads Congress and CPWD/KPWD specifications - 1996 / 2002 with correction slips & amendments up to date to the extent they are applicable to the works covered under scope of works. However, the provisions of CPWD/KPWD specifications take precedence over MORTH specifications. Further the specifications contained herein will supersede the provisions of the above to the extent of their applicability.

1.1.2 The Work shall be carried out in accordance with the "Good for Construction" drawings and designs as would be issued to the Contractor by the Engineer duly signed and stamped by him. The Contractor shall not take cognizance of any drawings, designs, specifications, etc. not bearing Engineer's signature and stamp. Similarly, the Contractor shall not take cognizance of instructions given by any other authorities except the instructions given by the Engineer in writing.

1.1.3 The work shall be executed and measured as per metric units given in the Schedule of Quantities, drawings etc. (FPS units where indicated are for guidance only).

1.1.4 Absence of terms such as providing, supplying, laying, installing, fixing etc. in the descriptions does not even remotely suggest that the Contractor is absolved of such providing at site, supplying etc. unless an explicit stipulation is made in this contract. The Owner shall bear no costs of materials, labour, equipment, duties, axes, royalties etc., unless stipulated particularly.

1.1.5 The specifications have been divided into different sections / sub-heads for convenience only. They do not restrict any cross-references. The Contractor shall take into account inter-relations between various parts of works/trades. No claim shall be entertained on the basis of compartmental interpretations.

1.1.6 The classification of various items of works for purposes of measurements and payments shall be as per bills of quantities (BOQ). Except where distinguished by BOQ, the rates apply to all heights, depths, sizes, shapes and locations. They also cater for all cuts and wastes. No floor wise separation shall be made for the rates. Likewise, all heights of cantering, shuttering, staging, formwork and scaffolding, trusses and erection methods are covered by the rates including multi stage propping for heights greater than one floor as per drawings.

1.1.7 Reference to the Standard Codes of Practice.

1. The Contractor shall make available at site all relevant Codes of practice as applicable.
2. Legend:
    a. ASCE- American Society of Civil Engineers
    b. ASME- American Society of Mechanical Engineers
    c. ASTM- American Society of Testing Materials
    d. BS- British Standard
    e. CPWD- Central Public Works Department
    f. DIN- Deutsches Institute fur Normung e.V.
    g. IRC- Indian Road Congress
    h. IRS- Indian Railway Standards
    i. IS- Indian Standards
    j. JIS- Japanese Industrial Standard
    k. MORTH- Ministry Of Road Transport and Highways
    l. UIC- International Union of Railways
    m. IRCEM- Institution de Retraite Complementaire des Employees de particular

1.1.8 Contractor to Provide

The Contractor shall provide and maintain at site throughout the period of works, the following at his own cost and without extra charge, except for the items specified in the Bill of Quantities the cost being held to be included in the Contract Rates:

1. General works such as setting out, site clearance before setting out and on completion of works. All weather approach roads to the site office should also be constructed and maintained in good condition.
2. All labour, materials, plant, equipment and temporary works, overhead charges as well as general liabilities, obligations, insurance and risks arising out of GCC, required completing and maintaining the works to the satisfaction of the Engineer.
3. Adequate lighting for night works, and also at other times whenever and wherever required by the Engineer.

4. Continuous & Rigid temporary fences, barricades/hoardings on both sides of the site occupied by the contractor including, guards, Nights and protective work necessary for protection of workmen, supervisors, Engineers, General public and any other persons permitted access to the site as approved by the Engineer. Contractor shall provide proper signage as directed.
5. All fences, barricade/hoardings shall be as per approved drawings and painted with colour shades as specified by the Engineer. The barricading/hoardings should be of adequate height to ensure visual obstruction of work from public view.
6. All equipment, instruments, labour and materials required by the Engineer for checking alignment, levels, slopes and evenness of surfaces measurements and quality etc.
7. Design mixes and testing them as per relevant clauses of specifications giving proportion of ingredients, sources of aggregates and binder along with accompanying trial mixes. Test results to be submitted to the Engineer for his approval before adoption of work.
8. Method statements, for each main activity of the work (temporary and permanent) to be executed detailing the purpose, scope, resources required, sequence / procedure of execution, persons responsible, time frame, safety requirements & measures, risk analysis, inspections, test procedures along with standard values / acceptable criteria etc. duly approved by the Engineer before start of that particular activity at site.
9. Contractor shall also prepare/approve and make available to the site Engineer the work procedure for each sub-activity to be done at the site, detailing the procedure/process to be followed including work sequence, safety measures to be followed, level of quality to be maintained, type of material to be used, type of finishing required and responsibility assigned etc.
10. Preparation and compliance with provision of a quality assurance control programme as per appendix 2 of special conditions of contract.
11. Prepare and submit standard quantities for the purpose of billing based on the approved drawings.
12. A testing laboratory as specified by the Engineer equipped with the following minimum apparatus, materials and competent trained staff required for carrying out tests, as specified in the relevant sections of the specifications/codes:
    a. 1 set of standard sieves for testing grading of sand with mechanical sieve shaker
    b. Sieves with openings respectively of 4.75mm, 10mm, 20mm, 25mm, 30mm, for testing and grading of aggregates.
    c. Weighing balance of capacity up to 10kg reading up to 5gm.
    d. Electric thermostat controlled oven and pans for drying of sand and aggregates
    e. Glass measuring flasks of ½ litre, 1 litre & 2 litre capacity.
    f. Flask for determining moisture content of sand.
    g. Slump cone with rod and V B apparatus, flow table to measure slump or DIN specifications (separate sets for laboratory and at site)
    h. Apparatus to measure permeability of concrete as per appendix 1700/|| of MORTH specifications.
    i. Minimum 24nos steel moulds for 150mm*150mm*150mm concrete test cubes. It may be necessary to provide more steel cube moulds depending upon concreting programme.

j. 25mm Dia. vibrator for compaction of concrete in test cubes and also vibrating table.

k. Concrete cube testing machine of 200 tonnes capacity with 3 dial gauges electrically operated.

l. Work benches, shelves, desks, sinks, and any other furniture and lighting as required by the Engineer.

m. Abrasion, flakiness & impact testing coarse aggregates.

n. Silt testing equipment.

o. Any other equipment specified by Engineer

p. Permeability testing apparatus.

1.1.9 Quality Assurance & Quality Control

1. The work shall conform to high standards of design and workmanship, shall be structurally sound and aesthetically pleasing. The contractor shall conform to the Quality standards prescribed, which shall form the backbone for the Quality Assurance and Quality control system.

2. At the site, the contractor shall arrange the materials, their stacking/storage in appropriate manner to ensure the quality. The contractor shall provide all the necessary equipment and qualified manpower to test the quality of materials, assemblies etc, as directed by the Engineer. The tests shall be conducted at specified intervals and the results of tests properly documented. The cost of all such testing shall be included the quoted rates and nothing extra shall be paid for in this regard. In addition, the contractor shall keep appropriate tools and equipment for checking alignment levels slopes and evenness of the surfaces.

3. Testing of Materials

   a) The Engineer shall be free to carry out such tests as may be decided by him at his sole discretion, from time to time, in addition to those specified in this document as per provisions of clause 28 of General Conditions of Contract. The contractor shall provide the samples and labour for collecting the samples. Nothing extra shall be payable to the contractor for samples, or for the collection of the samples. The test shall be conducted at the site laboratory that may be established by the contractor or at any other standard laboratory having NABL certification.

   b) The contractor shall transport the samples to the laboratory for which nothing extra shall be payable. In the event of the contractor falling to arrange transportation of the samples in proper time the Engineer shall have them transported and recover two times the actual cost from the contractor’s bills.

   c) All testing shall be performed in the presence of Engineer or his authorised representative. Testing may be witnessed by the contractor or his authorised representative if permitted by the Test house. Whether witnessed by the contractor or not, the test results shall be binding on the contractor.

   d) Cost of all such tests shall be borne by the contractor and nothing extra shall be payable on this account.

4. The Engineer shall have the right at all times to inspect all operations including the sources of materials, procurement, its transportation, layout and storage of materials, handling of materials and the quality control system. Such an inspection shall be arranged and the Engineer’s approval obtained prior to starting of the particular item of

work. This shall however, not relieve the contractor of his responsibilities. All materials which do not conform to these specifications shall be rejected. In the event of contractor not being able to arrange the material conforming to these specifications or in the event of failure of the contractor to get the sources approved within the agreed schedule submitted by contractor, the Engineer shall have the powers to cause the contractors to purchase and use such materials from any particular source, as may, in the Engineer's opinion be necessary for the proper execution of work. Nothing extra shall be payable to the contractor on this account.

5. Dimensions

    1. Figured dimensions on drawings shall only be followed and drawings to a large scale shall take precedence over those to a smaller scale. Special dimension or directions in the specifications shall supersede all others at tender stage where as those mentioned in the construction drawings supersede all others. All dimensions shall be checked at site prior to execution.

    2. The dimensions where stated do not allow for waste, laps, joints, etc. but the contractor shall provide at his own cost sufficient labour and materials to cover such waste, laps, joints, etc.

    3. The levels, measurements and other information concerning the existing site as shown on the drawings are believed to be correct, but the contractor should verify them for himself and also examine the nature of the ground as no claim or allowance whatsoever will be entertained on account of any errors or omissions in the levels or the description of the ground levels or strata turning out different from what was expected or shown on the drawings.

1.1.10 Setting Out of Works

The Contractor shall set out the Works indicated in the Conditions of Contract. The Contractor shall provide suitable stones with flat tops and build the same in concrete for temporary benchmarks. All the pegs for setting out the Works and fixing the levels required for the execution thereof shall, if desired by the Engineer, likewise be built in masonry at such places and in such a manner as the Engineer may direct. The Contractor shall carefully protect and preserve all benchmarks and other marks used in setting out the works. The contractor will make overall layout of complete work and get it checked from Engineer. The cost of all operations of setting out including construction of benchmarks is deemed to be included in the quoted rates as per Bill of Quantities.

a) All the survey work except levelling work shall be carried out using total stations with one second accuracy. The levelling work shall be carried out using Auto level.

b) The triangulations point given by BMRCL before start of work shall be maintained during execution and handed over back to BMRCL after completion.

1.1.11 **Materials**

It shall be the responsibility of the contractor to procure all the materials required for construction and completion of the contract. The contractor shall indicate in writing the source of materials well in advance to the Engineer, after the award of the work and before commencing the work. If the material from any source is found to be unacceptable at any time, it shall be rejected by the Engineer and the contractor shall forthwith remove the material immediately from the site as directed by the Engineer.

1. Quality

    All materials used in the works shall be of the best quality of their respective kinds as specified herein, obtained from sources and suppliers approved by the Engineer and

shall comply strictly with the tests prescribed hereafter, or where tests are not laid down in the specifications, with the requirements of the latest issues of the relevant Indian Standards or equivalent.

2. Sampling and Testing

   All materials used in the works shall be subjected to inspection and test in addition to test certificates. Samples of all materials proposed to be employed in the permanent works shall be submitted to the Engineer at least 45 days in advance for approval before they are brought to the site.

   Samples provided to the Engineer for their retention are to be labelled in boxes suitable for storage. Materials or workmanship not corresponding in character and quality with approved samples will be rejected by the Engineer.

   Samples required for approval and testing must be supplied sufficiently, in advance, in required quality and number to allow for testing and approval, due allowance being made for the fact that if the first samples are rejected further samples may be required. Delay to the works arising from the late submission of samples will not be acceptable as a reason for delay in completion of the works.

   Materials shall be tested before leaving the manufacturer's premises, quarry or source, wherever possible. Materials shall also be tested on the site and they may be rejected if not found suitable or in accordance with the specification, notwithstanding the results of the tests at the manufacturer's works or elsewhere or test certificates or any approval given earlier.

   The contractor will bear all expenses for sampling and testing, whether at the manufacturer's premises, at source, at site or at any testing laboratory or institution as directed by the Engineer. No extra payment shall be made on this account.

3. Dispatch of Materials

   Materials shall not be dispatched from the manufacturer's works to the site without written authority from the Engineer.

4. Test Certificates

   All manufacturer's certificates of test, proof sheets, etc showing that the materials have been tested in accordance with the requirement of this specification and of the appropriate Indian Standard or equivalent are to be supplied free of charge on request to the Engineer.

5. Rejection

   Any materials that have not been found to conform to the specifications will be rejected forthwith and shall be removed from the site by the Contractor at his own cost within two weeks or as instructed by the Engineer.

6. Storing of Materials at Site

   All materials used in the works shall be stored on racks, supports, in bins, under cover etc as appropriate to prevent deterioration or damage from any cause whatsoever to the entire satisfaction of the Engineer.

   The storage of materials shall be in accordance with IS 4082 "Recommendation on stacking and storage or construction materials on site" and as per IS 7969 "Safety code for handling and storage of building materials".

   The materials shall be stored in a proper manner at places at site approved by the Engineer. Should the place where material is stored by the Contractor be required by the

Employer for any other purpose, the Contractor shall forthwith remove the material from that place at his own cost and clear the place for the use of the Employer.

1.1.11 Water

1. Water from approved source

   Portable water only shall be used for the works. Contractor shall have his own source of water duly approved by Engineer. The water shall be free from any deleterious matter in solution or in suspension and be obtained from an approved source. The quality of water shall conform to IS 456.

2. Storage

   The Contractor shall make his own arrangements for storing water, if necessary, in drums or tanks or cisterns, to the approval of the Engineer. Care shall be exercised to see that water is not contaminated in any way.

3. Testing

   Before starting any work, requiring the use of water, and wherever the source of water changes, the water shall be tested for its chemical and other impurities to ascertain its suitability for use for approval of the Engineer. No water shall be used until tested and found satisfactory. Cost of all such Tests shall be borne by the contractor.

4. Cost of water

   Cost of arranging storing and testing of water shall be deemed to be included in the quoted rates in the Bill of Quantities and nothing extra shall be payable in this regard.

1.1.12 Cement

The grade of cement shall be as specified and conforming the relevant IS code and shall be purchased from the approved manufacturers.

Separate go downs shall have to be provided for different grades of cement. The fresh cement should be used. The cement older than 3 months will not be allowed to use at site. The cement should be stored in a water tight shed and on wooden planks giving sufficient gaps between walls and cement piles.

The actual issue and consumption of cement in works shall be regulated and proper accounts maintained as provided in the relevant clause of the contract. The theoretical consumption of cement shall be worked out as per procedure prescribed in relevant clause of the contract and shall be governed by conditions laid therein.

Cement (OPC of 43/53 grade as specified in documents in paper bags or any suitable packing shall be arranged by the contractor.

1.1.13 Coarse Aggregates

Coarse aggregate in size and quality shall be conforming to the relevant IS code and as specified in the documents.

The nominal maximum size of aggregate (MS) to be used in RCC and PSC work shall be 20mm. the other requirement shall be as per CPWD specification.

The aggregate shall be stored in such a way as to prevent mixing with foreign materials. Different sizes of coarse aggregate shall be stored in separate stock piles sufficiently away from each other in order to prevent intermixing the materials at the edges of the stock piles.

1.1.14 Fine Aggregates

The fine aggregate to be used for the work should be “River sand” conforming to zone-|| as per IS-383. the quality and acceptance criteria should be followed as per IS-383/1970 with latest correction slips. The decision of Engineer in this respect shall be final. The silt content of fine aggregate used for trial mixes shall be recorded & the silt content in fine aggregate used shall not exceed 8%. The tests acceptance criteria for fine aggregates shall be same as per CPWD specifications.

1.1.15 Other Materials

All other materials not specifically mentioned above shall be of best quality and shall conform to manufacturer’s specification. Wherever, no specific code of practice of IRS/IRC/BIS is applicable, the decision of Engineer is final and binding.

1.1.16 Workmanship

All works shall be true to level, plumb and square and the corners, edges and arises in all cases shall be unbroken and neat.

Any work not to the satisfaction of the Engineer or his representative will be rejected and the same shall be rectified, or removed and replaced with work of the required standard of workmanship at no extra cost.

1.1.17 Load testing on completed structures

1. During the period of construction or within the defect liability period the Engineer may at his discretion order the load testing of any completed structure or any part thereof if he has reasonable doubts about the adequacy of the strength of such structure for any of the following reasons;

    a. Results of compressive strength on concrete test cubes falling below the specified strength.
    b. Premature removal of formwork.
    c. Inadequate curing of concrete
    d. Over loading during the construction of the structure or part thereof
    e. Carrying concrete of any portion without prior approval of the Engineer
    f. Honey combed or damaged concrete which in the opinion of the Engineer is particularly weak and will affect the stability of the structure to carry the design load, more so in important or critical areas of the structure
    g. Any other circumstances attributable to alleged negligence of the contractor which in the opinion of the Engineer may result in the structure or any part thereof being of less than the expected strength.

2. All the loading tests shall be carried out by the contractor strictly in accordance with the instructions of the Engineer, IS:456 IRC codes and as indicated her under. Such tests shall be carried out only after expiry of minimum 28 days or such longer period as directed by the Engineer.

3. The structure shall be subjected to a super imposed load equal to the specified superimposed lad assumed in the design. This load shall be maintained for a period of 24 hours before removal. During the test, struts strong to take the whole load shall be placed in position leaving a gap under the members as directed. The deflection due to the super imposed load shall be recorded by sufficient number of approved deflecto meters capable of reading up to 1/500 of a cm and located suitably under the structure as directed by the Engineer.

4. In such cases the portion of the work concerned shall be taken down or cut out and reconstructed to comply with the specifications. Other remedial measures may be taken to

make the structure secure at the discretion of the Engineer. However, such remedial measures shall be carried out to the complete satisfaction of the Engineer.

5. All costs involved in carrying out the test ordered on the grounds as mentioned and other incidental expense there to shall be borne by the contractor regardless of the result of the test. In case of failure of the test the contractor shall take down or cut out and reconstruct the defective work or shall take the remedial measures, as instructed, at his own cost.

6. If the load testing is instructed on any ground other than mentioned, then the cost of the same shall be reimbursed if the test results are found to be satisfactory.

7. In addition to the above load tests, non-destructive tests on various elements (except on piles) such as core test and ultrasonic pulse velocity test shall be carried out by the contractor at his own expense if so desired by the Engineer. However, non-destructive testing of piles will be paid as per BOQ. Such tests shall be carried out by an agency approved by the Engineer and shall be done using only recommended testing equipment. The acceptance criteria for these tests shall be as specified by the testing agency or good Engineering practice and as approved by the Engineer.

1.2 Preliminary Work

1.2.1 Survey work

The said work involves at the very start of work taking-over of reference point from the Engineer, establishment of control points, triangulation points, bench marks, grid layout for all the piers/column and other structures maintaining horizontal and vertical control within the permissible limits, incorporating changes (if any), submission of full data in the tabulation form and survey drawings. The item is lump sum and shall be including setting and layout of various works during the progress of work and matching of the station area track alignment with the approaches at station ends and incorporating the changes (if any). The payment for the item shall be on pro data basis and will be spread over the duration of the contract.

1.2.2 Barricading

The work covers barricading for the work done along the median and areas affecting road traffic. Barricading for the other areas like casting yard, batching plant, storage and other working area shall be done at own cost by the contractor. The detailed scope of work is as follows:

a. Providing and installing the barricade of the design and type as shown in the typical sketch furnished as per the approved plan firmly to the ground and maintaining it during the progress of work.

b. Providing adequate road safety devices. A tentative list given here under identifies minimum items, which may be required. However actual numbers required will be as per approved plan by the Engineer and clearance from the traffic department, Bangalore. The contractor shall not be paid extra for any addition to this list if required during the execution of works.

c. Dismantling of barricading and other temporary installations from the site and cleaning the site as per direction of Engineer upon completion and acceptance of work.

1.2.3 Supply of progress photographs and album

The work covers the supply of colour photographs and along with negatives in an album to serve as a permanent record of various stages of work needed for an authentic documentation as approved by the Engineer.

The photographs shall be of acceptable quality and they shall be taken by a professionally competent photographer with camera having the facility to record the date of the photographs

taken in the prints and negative. The camera reel, type and quality of photo paper shall be of standard make approved by the Engineer. Each photograph in the album shall be suitably captioned and dated.

The rate for the supply of record photographs shall form a part of the records of BMRCL and the prints cannot be supplied to anybody else or published without the written permission of BMRCL.

1.2.4 Supply of video cassette of works

The work consists of taking video film of important activities of the works as directed by the Engineer during the currency of the project and editing them to a video film of the duration as indicated in the item. The cassette shall be approved make and of specified duration.

1.2.5 Site office for Engineer

The work covers the construction and provisions of furnished site office accommodation for the Engineer and maintaining the same

The contractor shall arrange to provide fully furnished office accommodation constructed as shown in drawings. Work includes providing electric supply, all electric items, like lights, fans, complete wiring, providing water supply including al pipes, fittings, tanks, valves etc. complete, septic tanks, drains, internal surface roads etc.

The contractor shall provide the office accommodation within 1 month from date of issue of the acceptance letter

The site office with all services, furniture and fittings shall be property of the contractor. The land for the site office shall not be provided by the Engineer.

The contractor shall arrange to maintain the site office including dad to day upkeep of the building and the surroundings, attending to repairs to various parts of the building, furniture, fittings, office equipment and the connected services as and when necessary, including periodic white/colour washing, painting. etc.

The contractor shall arrange to provide uninterrupted supply of electricity and water for the office building. In case of failure of main power/water supply, alternate source shall be provided.

1.3 Structural work

1.3.1 Unless otherwise specified, only controlled concrete with design mix and weigh batching is to be used for the work.

1.3.2 Minimum cement content for various grades/elements of concrete as specified as specified in MORTH specifications in CPWD specification 1996/2002 is purely from durability point of view. Larger content of cement shall have to provide if demanded by mix design or as per the requirement of relevant codes.

1.3.3 Provision of cement slurry to create bond between plain/reinforced concrete surface and subsequent applied finishes shall not be paid extra.

1.3.4 Mix design smaller aggregates of 10mm down shall also be done in advance for the use in the junction having congested reinforcement.

1.3.5 Procedure of mixing the admixtures shall be strictly as per the manufacturers' recommendations or as directed by the Engineer.

1.3.6 All the water tanks and other liquid retaining concrete structures shall undergo hydro testing

1.3.7 Special benches shall be provided at site for stacking reinforcement bars of different sizes

1.3.8 Formwork for beams of RCC works shall be designed in such a way that the form work of adjacent slabs can be removed without disturbing the props/supports of the beams.

1.3.9 Wherever there are tension/suspended concrete members which are suspended from upper level structural members, the shuttering/scaffolding of such members at lower level shall have to be kept in place till the time the upper level supporting members gain minimum required strength. Cost of such larger duration of keeping in place the shuttering/scaffolding shall be deemed to be included in the price quoted for respective structural members.

1.3.10 The contractor shall incorporate seismic considerations of anchoring and isolation in the design and detailing of the finishes as directed by the Engineer. The element to be anchored shall have its motion suitably restrained whilst at the same time it shall be suitably isolated so as not to be affected by the deformations/vibrations of the building during construction.

1.3.11 Formwork shall be provided for full height at all locations. Special precautions for such tall formwork shall be taken to ensure its safety. Extra costs for providing such formwork shall be deemed to have been included in the prices quoted against relevant items.

1.3.12 The contractor shall carry out expeditiously and without any delay the following works within the mobilisation period itself:

a. Identify and get approved the sources of various major constitution materials.
b. Material testing and mix design of concrete as contemplated in the specification.
c. Setting up of full-fledged site laboratory as per the requirements of these specifications.
d. Setting up concrete batching and mixing plant.
e. Site office for the use of the Engineer's staff.
f. Contractor's site office setup.
g. Casting yard with complete facilities.
h. Any other prerequisite items required for final execution.

1.3.13 Casting yard shall have following minimum facilities:

a. Casting beds as required
b. Sets of form work/moulds as required
c. All handling facilities for precast elements like over gantry, etc.
d. Curing arrangements as required
e. Stacking arrangements for materials and precast elements
f. Storing arrangement of materials
g. Proper drainage and all weather approach roads.

1.3.14 The load testing of spans/piles etc. shall be done using certified and calibrated dial gauges only. Use of levelling instruments for measuring deflections shall not be allowed.

1.4 Guarantees and Maintenance

1.4.1 The Contractor shall guarantee and undertake to maintain and rectify the various components of the Civil Works for their successful performance for the periods as specified below. The Contractor shall indemnify the Engineer for a similar period against any damage to property and injury to persons on account of any defective work or maintenance carried out by the Contractor. The format and text of the Guarantee and the Indemnity Bond shall be as followed in PWD/CPWD or as approved by the Engineer.

1.4.2 Responsibility for Shop Drawings, Samples, Mock-Ups and Factory visit

1.4.3 Approval of shop drawings, samples and mock-ups for the various components shall not absolve the Contractor of his responsibility of completing the work to the specifications, standards, tests for performance and guarantees given in these documents and to a quality of finish as desired by the Engineer.

1.4.4 Cleaning

Surfaces on which finishes are to be provided shall be cleaned with water jets or oil free compressed air or power tools with wire brushes and detergents as approved by the Engineer.

1.5 Applicable Codes, Standards & Publications for Structural and Architectural works

The most important Codes, Standards and Publications to Contract are listed here under:

CODES	Description - General
IS: 875 (part 3)	Code of practice for design loads (other than earthquake) for buildings and structures
IS: 1322	Bitumen felts for water proofing and damp-proofing
IS: 1893	Criteria for earthquake resistant design of structures
IS: 2572	Code of Practice for construction of hollow concrete block masonry
IS: 3414	Code of practice for design and installation of joints in buildings
IS: 3462	Specification for unbaked flexible PVC flooring
IS: 6408 (Parts 1,2)	Recommendations for modular co-ordination in building industry – tolerances
IS:10958	General check list of functions of joints in building
IS:11817	Classification of joints in buildings for accommodation of dimensional deviations during construction
IS:11818	Method of test for laboratory determination of air permeability of joints in buildings
IS:12440	Precast concrete stone masonry blocks
CPWD	Specifications 1996
BS:476 (Part 7)	Method for classification of the surface spread of flame of products
BS:476 (Part 20)	Method of determination of the fire resistance of elements of construction (general principles)
BS:476 (Part 22)	Methods for determination of the fire resistance of non-load bearing elements of construction
BS:5215	Specification for one-part gun grade polysulphide-based sealants
BS:5606	Guide to accuracy in building
BS:6093	Code of practice for the design of joints and jointing in building construction
BS:8200	Code of practice for the design of non-load bearing external vertical enclosure of building

CODES	Description - General
ASTM C 332	Specification for light weight aggregate for insulating concrete
SP 7	National Building Code of India
SP 23 (S&T)	Hand book on concrete mixes
B	**Bitumen**
IS:702	Industrial Bitumen
IS:3384	Specification for bitumen primer for use in waterproofing and damp-proofing
C	**Building Construction Practices**
IS: 1838 Parts I and II.	Specifications for preformed fillers for expansion joint in concrete pavements and structures.
IS: 1946	Code of Practice for use of fixing devices in walls, ceilings, and floors of solid construction.
IS: 6509	Code of Practice for installation of joints in concrete pavements.
IS: 11134	Code of Practice for setting out of buildings.
IS: 11433	Parts I and II. Specifications for one part Gun grade polysulphide based joint sealant.
IS: 12200	Code of Practice for provision of water stops at transverse contraction joints in masonry and concrete dams
D	**Cement**
IS: 269	33 grade ordinary Portland cement
IS: 455	Portland Slag Cement
IS: 650	Specification for standard sand for testing cement.
IS: 1489 (Part 1)	Portland pozzolana cement: Flyash based
IS: 1489 (Part 2)	Portland pozzolana cement: Calcined clay based
IS: 3535	Method of Sampling Hydraulic Cements
IS: 4031	(Parts 1 to 13) Methods of physical tests for hydraulic cement.
IS: 4032	Method of chemical analysis of hydraulic cement.
IS: 6925	Methods of test for determination of water soluble chlorides in concrete admixtures.
IS: 8042	White Portland Cement
IS: 8112	Specification for 43 grade ordinary Portland cement.
IS: 12269	Specification for 53 grade ordinary Portland cement.
IS: 12330	Specification for sulphate resistant Portland cement
E	**Concrete**

CODES	Description - General
IS:456	Code of practice for plain and reinforced concrete.
IS:457	Code of practice for general construction of plain and reinforced concrete for dams and other massive structures.
IS:460 (Parts 1 to 3)	Specification for test sieves
IS:516	Methods of tests for strength of concrete
IS:1199	Methods of sampling and analysis of concrete
IS:1200	Method of measurement of building and civil Engineering
IS:1343	Code of practice for pre stressed concrete
IS:1607	Method of testing sieving
IS:2386	Parts 1-8 methods of tests for aggregates of concrete
IS:2430	Methods of sampling of aggregates of concrete
IS:2438	Specification for roller pan mixer
IS:2514	Specification for concrete vibrating tables
IS:2571	Code of practice for laying in-situ cement concrete flooring
IS:2645	Specifications for integral cement water proofing compounds
IS:2722	Specifications for portable swing batchers for concrete (double bucket type)
IS:3025	Methods of sampling and test (physical and chemical) for water & waste water
IS:3370	Code of practice for concrete structures for storage of liquids
IS:3935	Code of practice for composite construction
IS:4326	Code of practice for earthquake resistant construction of building
IS:6925	Methods of test for determination of water soluble chlorides in concrete Admixtures
IS:7242	Specifications for concrete spreaders
IS:7251	Specifications for concrete finishers
IS:7861	Parts I & II. Code of practice for extreme weather concreting.
IS:7969	Safety code for handling and storage of building materials
IS:8989	Safety code for erection of concrete framed structures
IS:8142	Methods of test for determining setting time of concrete by penetration resistance
IS:9103	Specifications for admixtures for concrete
IS:9013	Method of making, curing and determining compressive strengths of accelerated cured concrete test specimens

CODES	Description - General
IS:9284	Method of test for abrasion resistance of concrete
IS:10262	Recommended guidelines for concrete mix design
MORTH	Specifications for road and bridge works, ministry of road transport and highways (road wings)
IRS	Concrete bridge code
IRC:21-2000	Standard specifications and code of practice for road bridges section 3 – cement concrete (plain & reinforced) (first revision)
IRC:18-2000	Design criteria for pre stressed concrete road bridges (post tensioned concrete)
ASTM –C–94	Ready mix concrete
IS 4926:2003	Ready mixed concrete-code of practice
ASTM-C-1240	Specifications for silica fume for use in hydraulic cement and mortar
F	**Construction Plant and Machinery.**
IS:1791	Specification for batch type concrete mixers
IS:2505	General requirements for concrete vibrators: immersion type
IS:2506	General requirements for screed board concrete vibrators
IS:3366	Specification of pan vibrators
IS:3558	Code of practice for use of immersion vibrators for consolidating concrete
IS:4656	Specifications for form vibrators for concrete.
IS:4925	Specification for concrete batching and mixing plant
IS:11993	Code of practice for use of screed board concrete vibrators
G	**Formwork**
IS:4990	Specifications for plywood for concrete shuttering works
IRC:87	Guidelines for the design and erection of false work road bridges
IS:806	Code of practice for use of steel tubes in general building construction
IS:1161	Specification of steel tubes for structural purposes
IS:1239	Specification for mild steel tubes. Tubulars and other wrought steel fittings
H	**Gypsum and Gypsum Board**
IS:2095	Gypsum plaster boards
IS:2542 (Part 1/Sec 1 to 12)	Methods of test for gypsum plaster, concrete and products: plaster and concrete

CODES	Description - General
IS:2542 (Part 2/Sec 1 to 8)	Methods of test for gypsum plaster, concrete and products: Gypsum products
IS:2547 (Part 1)	Gypsum building plaster: Excluding premixed lightweight plaster
IS:2547 (Part 2)	Gypsum building plaster: Premixed lightweight plaster
I	**Handling and Storage**
IS:4082	Recommendation of Stacking and Storage of construction materials
IS:8348	Code of practice for stacking and packing of stone slabs for transportation
J	**Instruments For Testing Cement and Concrete**
IS:5513	Specification for vicat apparatus.
IS:5514	Specification for apparatus used in Le-Chaterlier test.
IS:5515	Specification for compaction factor apparatus.
IS:7320	Specification for concrete slump test apparatus.
IS:7325	Specification for apparatus to determine constituents of fresh concrete.
IS:10080	Specification for vibration machine.
IS:10086	Specification for moulds for use in tests of cement and concrete.
IS:10510	Specification for vee-bee consistometer.
K	**Joint Fillers**
IS:1838 (Part 1)	Preformed fillers for expansion joint in concrete pavements and structures (non-extruding and resilient type): Bitumen impregnated fibre
L	**Paints and Coatings**
IS:102	Ready mixed paint, brushing, red lead, non-setting, priming
IS:109	Ready mixed paint, brushing, priming, plaster, to Indian Standard Colour No. 361 and 631 white and off white.
IS:347	Varnish, shellac, for general purpose.
IS:2074	Ready mixed paint, air drying, red oxide-zinc chrome, priming
BS:6496	Specification for powder organic coatings for application and stoving to aluminium alloy extrusions, sheet and preformed sections for external architectural purposes, and for the finish on aluminium alloy extrusions, sheet and preformed sections coated with powder organic coatings
BS:EN:10152	Specification for electrolytic ally zinc coated cold rolled steel flat products. Technical delivery conditions

CODES	Description - General
ASTM A 164-71	Specification for electrodeposited coatings of zinc on steel
M	**Pigment for Cement**
BS:1014	Specification for pigments for Portland cement and Portland cement products
N	**Reinforcement & Structural Steel**
IS:280	Mild steel wire for general Engineering purposes
IS:432	Part I. Mild steel and medium tensile steel bars. Part II Hard drawn steel wire.
IS:814	Parts 1 & 2 electrodes for metal arc welding of structural steel
IS:815	Classification coding of covered electrodes for metal arc welding of structural steels
IS:816	Code of practice for use of metal arc welding for general construction of mild steel
IS:1566	(Part I) Specifications for hard-drawn steel wire fabric for concrete reinforcement.
IS:1786	Specification for high strength deformed steel bars and wires for concrete reinforcement.
IS:2502	Code of Practice for bending and fixing of bars for concrete reinforcement.
IS:2629	Recommended practice for hot-dip galvanising of iron and steel.
IS:2751	Code of Practice for welding of mild steel plain and deformed bars for reinforced concrete construction.
IS:4759	Hot-dip zinc coating on structural steel and other allied products.
IS:5525	Recommendations for detailing of reinforcement in reinforced concrete works
IS:9417	Recommendations for welding cold-worked steel bars for reinforced concrete construction.
IS:14268	Uncoated stress relieved low relaxation steel class 2 for Prestressed concrete
IS:226	Structural steel (Standard Quality)
IS:800	Code of practice for use of structural steel in general building construction.
IS:813	Scheme of symbols for welding.
IS:814	Covered electrodes for metal arc welding of structural steel. (Part I & Part II)

CODES	Description - General
IS:816	Code of practice for use of metal arc welding for general construction in mild steel.
IS:822	Code of practice for inspection of welds.
IS:961	Structural steel (High Tensile)
IS:1024	Code of practice for use of welding in bridges and structures subject to dynamic loading.
IS:1161	Steel tubes for structural purposes.
IS:1182	Recommended practice for radiographic examination of fusion welded butt joints in steel plates.
IS:2062	Structural steel (Fusion welding quality)
IS:3063	Single Coil Rectangular Section Sprint Washers for Nuts, Bolts and Screws
IS:3443	Crane Rail Sections
IS:3757	Specification for high tensile friction grip bolts.
IS:5624	Specification for foundation bolts.
IS:3600	Code of practice for testing of fusion welded (Part I) joints and weld metal in steel.
IS:4923	Hollow steel sections for structural use.
IS:6227	Code of practice for use of metal arc welding in tubular structure.
IS:801	Code of practice for use of cold formed light gauge steel structural members in general building construction.
IS:811	Specifications for cold formed light gauge structural steel sections.
IS:8500	Structural steel Micro alloyed (Medium and high strength qualities
IS:8910	General requirements of supply of weldable structural steel
IS:9595	Recommendations for metal arc welding of carbon & Carbon-Manganese steels
IS:7205	Safety code for erection of structural steel works
O	**Sand**
IS:383	Coarse and fine aggregates from natural sources for concrete.
P	**Scaffolding**
IS:2750	Specification for steel scaffoldings

CODES	Description - General
IS:3696 (Part 1)	Safety Code of scaffolds and ladders: Scaffolds
IS:3696 (Part 2)	Safety Code of scaffolds and ladders: Ladders
IS:4014 (Part 1)	Code of practice for steel tubular scaffolding: Definition and materials
IS:4014 (Part 2)	Code of practice for steel tubular scaffolding: Safety regulations for scaffolding
IRC:87	Guidelines for the design and erection of false work for road bridges
Q	**Sealants**
IS:10959	Glossary of terms for sealants for building purposes
IS:11433 (Part 1)	One part grade polysulphide base joint sealant: General requirements
IS:11433 (Part 2)	One part grade polysulphide base joint sealant: Methods of test
IS:13055	Methods of sampling and test for anaerobic adhesives and sealants
BS:5889	Specification for one part gun grade silicone-based sealants.
R	**Wood**
IS:303	Plywood for General Purposes
IS:848	Synthetic resin adhesives for plywood (phenolic and amino plastic)
IS:1141	Seasoning of Timber – Code of Practice
IS:1328	Veneered decorative plywood
IS:1659	Block Boards
IS:2046	Decorative thermosetting synthetic resin bonded laminated sheets
IS:2202 (Part 1)	Wooden flush door shutters (solid core type): Plywood face panels
IS:2202 (Part 2)	Wooden flush door shutters (solid core (type): Particle face panels and hardboard face panels
S	**Bearings**
IRC:83 Part-2	Standard specifications and code of practice of road bridges elastomeric bearings
IRC:83 Part-3	Standard specifications and code of practice of road bridges pot bearings
T	**UPVC pipe for drainage**
IS:4985	Un-plasticized PVC pipes for portable water supplies
U	**Piling**
IS:2911 (Part 1)	Bored cast in-situ concrete piles

CODES	Description - General
IRC:78	Standard specifications and code of practice for road bridges foundation and substructure
V	**All Indian Railway standards**
W	**Most specifications for road and bridge works (latest revision)**
X	**CPWD specifications (latest revision)**

1.6 Temporary work

1.6.1 All designs for temporary work shall conform to and comply with all the requirements given in the latest editions of the relevant Indian standard specifications and codes of practice and other technical specifications as detailed in this tender

1.6.2 For all work for which the contractor has to submit design for approval and proof checked by third party of the employer, the same shall be got prepared by the contractor from approved consultants who are specialised in this field. For particular item of scaffolding, staging and shuttering, use of any proprietary method of staging should be supplemented with proper designs of such system after getting approval from the Engineer.

1.6.3 The contractor shall assess with due care the supplementary site investigations needed to verify all topographical, hydrological and other site data indicated in the tender and also collect such additional site data/geo-technical data as may be necessary for doing the job and safety of structure

1.6.4 The Engineer at his discretion may order any supplementary geo-technical investigation after award of the contract for verification and evaluation of any relevant data including geo-technical data, and no claim for extra payment on this account of variation of site data so evaluated shall be tenable subject to other relevant provisions of the tender elsewhere.

2 Structural Concrete: Plain, Reinforced & Pre-stressed

These specifications shall be read in conjunction with the MORTH and CPWD specifications 1996/2002 with correction slips/amendments up to date, and other relevant specifications described in the section 1 of these specifications.

2.1 Materials

Before bringing to the site, all materials for concrete including their source shall be approved by the Engineer. All approved samples shall be deposited in the office of the Engineer before placing orders for the materials with suppliers. The materials brought on to the works shall conform in every respect to the approved samples.

In case of change in type and/or source of any approved material, the contractor shall inform the Engineer and fresh samples shall be deposited with Engineer. Prior approval of Engineer will have to be obtained before using such material at site. The contractor shall check fresh consignment of materials as it is brought on to the works to ensure that they conform to the specifications and/or approved drawings.

The Engineer shall have the option to have of the materials tested at any time to find out whether they are in accordance with specifications at the contractor's expense. All bills vouchers and test certificates which in the opinion of the Engineer are necessary to convince him as to the quality of materials or their suitability shall be produced for his inspection when required.

Any material which has not been found to conform to the specifications and not approved by the Engineer shall be rejected forthwith and shall be removed from the site by the contractor at

his own cost within the time stipulated by the Engineer. In the event of contractor not being able to arrange the material conforming to specifications or in the event of failure of the contractor to get the sources approved within the agreed schedule submitted by contractor, the Engineer shall have the powers to cause the contractors to purchase and use such materials from any particular source, as may, in the Engineer's opinion, be necessary for the proper execution of work. Nothing extra shall be payable to the contractor on this account.

Contractor shall also ensure that all constituents of exposed concrete shall be taken from same sources to achieve a uniform colour and texture.

2.1.1 Cement

The cement used shall be of following types:

a. 43 grade ordinary Portland cement conforming to IS:8112

b. 53 grade ordinary Portland cement conforming to IS:12269

For piling and foundation work, type of cement shall be as mentioned in section S-08 pile foundations herein.

Whenever possible all cements of each type shall be obtained from one constant source throughout the contract. Cement of different types shall not be mixed together. Different brands of cement, or the same brand of cement from different sources, shall not be used without prior approval of the Engineer.

Packaged cement shall be delivered to the site in original sealed bags which shall be labelled with the weight, name of manufacturer, brand and type including date of manufacture. Cement received in torn bags shall not be used.

All cement shall be fresh when delivered. Cement older than 3 months from the date of manufacture shall not be used.

In fair faced elements, the cement used in the concrete for any complete element shall be from a single consignment. All cement for exposed concrete shall be from the same approved source and uniform in colour.

With each and every delivery of cement consignment, the contractor shall provide manufacturer's certificate that the cement conforms to the relevant Indian standard. the contractor shall provide complete facilities at site for carrying out the following tests:

a. Setting time by vicat's apparatus as per IS:4031 and IS:5513

c. Compressive strength of cement as per IS:4031, IS:650 and IS:10080

Total chloride content in cement shall in no case exceed 0.05 percent by mass of cement. Also, total sulphur content calculated as sulphuric anhydride(SO3) shall in no case exceed 2.5 percent and 3.0 percent when tri-calcium aluminate percent by mass is up to 5% or greater than 5% respectively

2.1.2 Aggregates

Aggregates from natural sources shall be in accordance with IS:383. The contractor shall submit to the Engineer certificates of grading and compliance for all consignments of aggregate. In addition, at site from time to time, the contractor shall allow for carrying out such tests and for supplying test records to the Engineer. The aggregates shall be procured from approved sources only as directed by the Engineer from time to time.

2.1.3 Fine aggregates

The fine aggregate to be used for the work should be "River sand" conforming to zone-|| as per IS-383. the quality and acceptance criteria should be followed as per IS-383/1970 with latest correction slips. The decision of Engineer in this respect shall be final. The silt content of fine

aggregate used for trial mixes shall be recorded & the silt content in fine aggregate used shall not exceed 8%. The tests acceptance criteria for fine aggregates shall be same as per CPWD specifications.

2.1.4 Coarse aggregates

The coarse aggregate shall be crushed stone

Coarse aggregate obtained from crushed or broken stone shall be angular, hard, strong, dense, non-porous, durable, clean and free from soft, friable, thin plate, elongated or flaky pieces and any deleterious material.

Except where it can be shown to the satisfaction of the Engineer that a supply of properly graded aggregates of uniform quality can be maintained over the said period of the works, the grading of aggregates shall be controlled by obtaining the coarse aggregates in different sizes and blending them in correct proportions as and when required.

All coarse aggregates shall conform to IS:383 and tests for conformity shall be carried out as per IS:2386 (parts 1-8).

The maximum size of coarse aggregates shall be such that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and fill the corners of formwork. Unless otherwise permitted by the Engineer the nominal maximum size shall not exceed 20mm.

2.1.5 Water

Water used in the works shall be potable water and free from deleterious materials. Water used for mixing and curing concrete as well as for cooling and washing aggregate shall be fresh, clean and free from injurious amounts of oil, salts, acids, alkali, other chemicals and organic matter.

Water shall be from the source approved by the Engineer and shall be in accordance with clause 5.4 of IS: 456 however, chloride content in water shall not exceed 500mg/litre.

Whenever the source of water changes, the water shall be tested for its chemical and other properties/impurities to ascertain its suitability for use in concrete for approval of the Engineer. No water shall be used until tested and found satisfactory. Cost of all such tests shall be borne by the contractor.

2.2 Blending of Aggregates

In order to obtain optimum workability, individual aggregates of nominal size 20mm, 10mm, 4.75mm and 2.36mm will be blended in such a way the grading curve for all in aggregates will be a smooth curve from size 0.15mm to 20mm falling within the established envelope grading curve. Contractor shall establish envelope grading curve. Contractor shall establish envelope grading curve for each grade of concrete for given maximum size of aggregates and get it approved by Engineer before finalising the mix design.

2.3 Admixtures

2.3.1 Chemical admixtures are not to be used until permitted by the Engineer. In case their use is permitted, the type, quantity/dosage and method of use of any admixture proposed by the contractor shall be submitted to the Engineer for approval. The admixture cement content specified shall not be reduced on account of the use of the admixtures.

2.3.2 The contractor shall further provide the information concerning each admixture to the Engineer as per Para 1012.1 of MORTH specifications.

2.3.3 In reinforced concrete works, the chloride content of any admixture used shall not exceed 2 percent by weight of the admixture as determined in accordance with IS:6925 and the total

chloride and sulphate contents in concrete mix shall not exceed 0.15 and 4.0 percent respectively by weight of cement.

2.3.4 The admixtures when used shall conform to IS9103 the suitability of all admixtures shall be verified by trial mixes

2.3.5 The addition of calcium chloride to concrete containing embedded metal will not be permitted under any circumstances

2.3.6 Retarding admixtures when shall be based on lingosus-phonates with due consideration to clause 5.2and 5.3 of IS: 7861

2.4 Batching plants, mixers and vibrators

2.4.1 Unless otherwise specified in the schedule of items, for all structural concreting work the contractor shall provide automatic weigh-batching plant of suitable capacity. The plant used shall conform to IS: 4925 the batching plants should have printing facilities to printout records of each batch in the format approved by the Engineer

2.4.2 The contractor shall provide concrete mixers (IS: 1791-batch type concrete mixers, IS: 2438-roller pan mixer) and vibrators (IS: 2505-concrete vibrators immersion type, IS: 2506-screed board concrete vibrators, IS: 4656-form vibrators for concrete) supplied by recognised manufacturers.

2.5 Grade of concrete

The concrete is designed as follows:

Concrete M25/20

The letter M refers to the mix

The number 25 represents the characteristic strength of 15cm cubes at 28 days in MPa (mega Pascal: 1MPa:10kg/cm2 approximately) M25 concrete thus has a characteristic strength of 250kg/cm2. Other mix design will also be denoted in same way.

The number 20 represents the nominal size of the coarse aggregates in mm.

2.6 Mix design

It is the complete responsibility of the contractor to design the concrete mixes by approved standard methods and to produce the required concrete conforming to the specifications and the strength, workability requirements approved by the Engineer.

Mix design once approved must not be altered without prior approval of Engineer however should the contractor anticipate any change in quality and change in source of future supply of materials than that used for preliminary mix design, he should inform the Engineer quite in advance and bring fresh samples sufficiently in advance, to carry out fresh trial mixes. Design mix will indicate by means of graphs and curves etc. The extent of variation in the grading of aggregates which can be allowed.

Limits of water and cement contents

Maximum water/cement ratio

a. For RCC members including piles – 0.40

b. For PSC members – 0.40

Cement content

Not with standing to the stipulations in any code, cement content in concrete shall not be less than 380kg/cum for RCC work and 400kg/cum for PSC work under normal exposure. In case of piling work minimum cement content shall be as specified under the section “pile foundations”.

However maximum cement content shall be limited to 540kg/cum of concrete. Ordinary Portland cement (OPC) of 43 grade and 53 grade conforming to IS: 8112 and IS: 12269 respectively shall be used. For pre stressed concrete, cement conforming to OPC 53 grade cement shall be used. However, for nominal mixes, CPWD specifications will be followed. 'Cement' means ordinary Portland cement and excludes the additions as mentioned in Para 5.2 of IS: 456.

As regards trial mixes, acceptance criteria, acceptance specification, lot size, sampling and testing and sampling size for piling work, PSC girders (cast-in-situ and precast post tensioned) and general work, the requirement of the relevant codes, standards and directions of the Engineer shall be followed. For piling work slag cement is to be followed.

2.7 Additional tests for concrete

As frequently as the Engineer may require, additional tests shall be carried out of concrete in addition to mandatory test specified in MORTH specifications, CPWD specifications 1996/relevant IS codes.

Permeability test for concrete

The concrete will be verified for permeability by the following procedure and shall confirm to IS: 3085-1965-'permeabilty of cement mortar and concrete. Section 1716.5 of MORTH specifications and DIN 1048.

The Engineer shall select random batches of concrete for examination at his discretion and sampling will generally be done at the point of discharge from the mixer and at placing point.

From the batches thus selected two concrete cylinders shall be made in accordance DIB 1048

1. At least two cylinders shall be made on each day's concreting until 60 cylinders have been made for each grade of concrete.

All cylinders shall be made, cured, stored, transported and tested in accordance with clause 1716.5 of MORTH specifications. The tests shall be carried out in a laboratory having NABL certification.

Test procedure

The permeability of concrete will be verified by the following procedure:

a. Prepare a cylindrical test specimen 150mm dia and 160mm high

b. After 28 days of curing, test specimen will be fitted in a machine such that the specimen can be placed in water under pressure up to 7 bars. The typical machine shall be similar to one shown in appendix 1700/|| of MORTH

c. At first a pressure of one bar is applied for 48 hours, followed by 3 bars for 24 hours and 7 bars for next 24 hours.

d. After the passage of the above period, the specimen is taken put and split in the middle by compression applied on two round bars on opposite sides above and below.

e. The water penetration in the broken core is measured with scale and the depth of penetration assessed in mm (max permissible limit 25mm)

f. Acceptability criteria

g. The concrete shall pass the permeability test if it is properly compacted and is not considered permeable when tested as above

h. No extra payment shall be made for this test and cost of the same should be included in the quoted rate for concrete work.

2.8 Batching of concrete ingredients

Unless permitted by the Engineer, all concreting shall be produced in computerized automatic weigh batching plant having printing facilities to print out records of each batch and installed at site. Under exceptional circumstances ready mix concrete (RMC) manufactured in computerised automatic weigh batching plant (as per specifications described above) by the approved agencies using the constituent materials from approved sources and approved mix design may also be used with prior approval from Engineer nothing extra shall be paid for such RMC used in the work including transportation, placing in position etc. However, in such cases the RMC production & transportation will have to be directly supervised by the qualified personnel of the contractor (contractor has to setup his own batching plants. RMC from market will be permitted only in exceptional circumstances and to be decided by the Engineer)

2.9 Placing temperatures

During extreme hot or cold weather, the concreting shall be done as per procedures set out in IS: 7861, parts 1 & 2.

The placing temperature of concrete shall be as low as possible in warm weather and care shall be taken to protect freshly placed concrete from overheating by sunlight in the first few hours of its laying. The time of day selected for concreting shall also be chosen so as to minimise placing temperatures. In case of concreting in exceptionally hot weather the Engineer may at his discretion specify the use of ice either flaked and used directly in the mix or blocks used for chilling the mixing water. In either case, the contractor shall not be paid extra for cost of ice, additional labour involved in weighing and mixing etc. All salt and saw dust shall be removed from ice before use. Quality of water used for making ice shall confirm to IS: 456

2.10 Transporting, placing, compacting and curing

Transporting, placing, compacting and curing of concrete shall be in accordance with IS: 456

2.10.1 Transporting

The method of transportation used should efficiently deliver the concrete to the point of placement without significantly altering its desired properties with regard to water-cement ratio, slump, segregation and homogeneity.

The mix after discharging from the automatic computerised weigh batching plant/mixer shall be transported by agitating transit mixers, buckets, pumps etc. Or as approved by the Engineer without causing segregation and loss of cement slurry and without altering its desired properties with regard to water cement ratio, slump, air content, cohesion and homogeneity. It should be ensured that the concrete is moved to its final destination before it attains the initial set.

The revolving drum truck bodies of approved make shall be used for transporting the concrete. The number of revolutions at mixing speeds, during transportation, and prior to discharge shall be specified and agreed upon. Reliable counters shall be used on revolving drum truck units. Standard mixer uniformity tests, conforming to ASTM standards C 94 ‘standard specifications for RMC’ shall be carried out to determine whether mixing is being accomplished satisfactorily.

2.10.2 Water, admixtures and slump

The amount of water required for proper concrete consistency shall take into account the rate of mixing, length of haul, time of unloading, and ambient temperature conditions

Additions of water to compensate for slump loss should not be resorted to nor should the design maximum water-cement ratio be exceeded. Additional dose of retarder be used to compensate the loss of slump at contractor’s cost, when permitted by Engineer. Re tempering water shall not be allowed to be added to mixed batches to obtain desired slump.

2.10.3 Placing

The method of placing shall be such as to prevent segregation by providing windows in the formwork for pouring concrete or by tremie pipe. The thickness of horizontal layers shall not exceed 300mm. High velocity discharge of concrete causing segregation of mix shall be avoided. The concrete shall be in the forms gently in such a way that the segregation does not take place. The concrete shall not be dropped from a height exceeding 2.0m. each layer of concrete shall be compacted fully before the succeeding layer is placed and separate batches shall follow each other close enough to ensure that the succeeding layer shall be placed and fully compacted before the layer immediately below has taken initial set. (the temperature to be maintained during pouring of concrete shall be refer to IS: 7861 part 1 & 2.)

For piers and pier heads, portal columns, concreting is to be carried out in single stage i.e. in first stage concreting will be from kicker to just below pier head bottom and second stage of concreting will be pier head including shear key and cross girder (for all heights by using tremie/pumps at the rate not more than 1.5m/hr or as approved by Engineer)

Concreting of any portion or section of the work shall be carried out in one continuous operation and no interruption of concreting work will be allowed without approval of the Engineer.

2.10.4 Compaction

Internal (needle) and surface (screed board) vibrators of approved make shall be used for compaction of concrete.

Internal vibrators shall be used for compaction of concrete in foundations, columns, buttresses arch section, slabs, etc. And if required surface vibrators shall also be used. Depending on the thickness of layer to be compacted, 25mm, 40mm, 60mm, 75mm dia internal vibrators will be used. The concrete shall be compacted by use of appropriate diameter vibrator by holding the vibrator in position until:

a. Air bubbles cease to come to surface.

b. Resumption of steady frequency of vibrator after the initial short period of deep in the frequency, when the vibrator is first used.

c. The tone of the vibrated concrete become uniform

d. Flattened, glistening surface, with coarse aggregates particles blended into it appears on the surface.

e. After the compaction is completed, the vibrator should be withdrawn slowly from the concrete so that concrete can flow in to the space previously occupied by the vibrator. To avoid segregation during vibration the vibrator shall not be dragged through the concrete nor used to spread the concrete. The vibrator shall be Made to penetrate, into the layer of fresh concrete below if any for a depth of about 150mm. The vibrator shall be made to operate at a regular pattern of spacing. The effective radii of action will overlap approximately half a radius to ensure complete compaction.

f. To secure even and dense surfaces free from aggregate pockets, vibration shall be supplemented by tamping or rodding by hand in the corners of forms and along the form surfaces while the concrete is plastic.

g. A sufficient number of standby vibrators shall be kept readily accessible to the place of deposition of concrete to assure adequate vibration in case of breakdown of those in use.

b. Form vibrators whenever used shall be clamped to the sides of formwork and shall not be fixed more than 450mm above the base of the new formwork and concrete shall be

filled not higher than 230mm above the vibrator. The formwork must be made specially strong and watertight where this type of vibrator is used.

c. Plain concrete in foundations shall be placed in direct contact with the bottom of the excavation, the concrete being deposited in such a manner as not to be mixed with the earth. Plain concrete also shall be vibrated to achieve full compaction.

d. Green concrete shall be protected from the direct sunlight and hot winds as per the methods approved by Engineer. Such method should be got approved from the Engineer before start of concreting.

Concrete placed below the ground shall be protected from falling earth during and after placing. Concrete placed on ground containing deleterious substances shall be kept free from contact with such ground and with water draining there from during placing and for a period of seven days or as otherwise instructed thereafter. Approved means shall be taken to protect immature concrete from damage by debris, excessive loading, abrasion, vibration, deleterious ground water, mixing with earth or other materials, and other influences that may impair the strength and durability of the concrete.

2.10.5 Field control

Sampling at both, truck discharge and point of final placement shall be employed to determine if any changes in the slump and other significant mix characteristics occur. However, for determining strength of concrete, cubes shall be taken from the placement end of line.

2.10.6 Curing

a. Curing of concrete shall be complete and continuous using potable water free from chlorides and sulphates water that is free of harmful amounts of deleterious materials that may attach, stain or discolour the concrete as per IS:456. Minimum wet curing will be for seven days by ponding water followed by moist curing by spraying water which shall be maintained up to a total period of at least 21 days from the date of casting.

b. Immediately after compaction and completion of any surface finishes the concrete shall be protected from the evaporation of moisture by means of polythene sheathing, wet hessian or other material kept soaked by spraying. As soon as the concrete has attained a degree of hardening sufficient to withstand surface damage moist curing shall be implemented and maintained for a period of at least 15 days after casting.

c. Method of curing and their duration shall be such that the concrete will have satisfactory durability and strength and members will suffer a minimum distortion, be free from excessive efflorescence and will not cause undue cracking in the works by shrinkage.

d. Steam curing with approved methodology can be adopted if required, for precast segments. No extra payment will be made for adopting steam curing.

e. Water based curing compounds may be permitted with specific approval of Engineer. However, it is required to be proved that by using such curing compound, the concrete shall not have less strength than concrete cured by water curing. It shall not leave any discolorations on the structural concrete. It shall be applied as per the provisions of clause 1713.3 of MORTH specifications. No extra payment will be made for the same.

2.11 Construction joints

Construction joints in all concrete works shall be made as directed by the Engineer. Where vertical joints are required, shuttering shall be fixed as directed to ensure that the concrete does not take natural slope.

Before fresh concrete is placed on the vertical joint, the old concrete shall be chipped, cleaned and moistened.

No separate payment shall be allowed to the contractor for forming joints or chipping and cleaning them. When a horizontal construction joint is formed, provision shall be made for interlocking with the succeeding layer by the embedment of saturated wooden blocks or wooden strips bevelled on four sides to facilitate their removal. Prior to the next pour the wooden pieces shall be loosened and removed in such a manner as to avoid injury to the concrete.

Construction joints in concrete walls and slabs for liquid retaining structures shall be prepared in a similar manner to normal construction joints. If use of metal, rubber or plastic water stops is specified, this shall be cast into joints. Measures shall be taken by the contractor to ensure that no displacement or distortion of water stops takes place during placing of concrete. The construction joints shall ensure proper bond and leak proof joint.

2.12 Cracks

If cracks, which in the opinion of the Engineer may be determinable to the strength of the construction, develop in concrete construction, the contractor at his own expense shall test the structure as specified in clause 1.1.16 of 'loading tests' of these specifications. If under such test loads the cracks develop further, the contractor shall dismantle the construction, carry away the debris, replace the construction and carry out all consequential work thereto.

If cracks develop in the concrete construction, which in the opinion of the Engineer, are not detrimental to the stability of the construction, the contractor at his own expense shall grout the cracks with neat cement grout or with other composition as directed by Engineer and also at his own expense and risk shall make good to the satisfaction of the Engineer all other works such as plaster, moulding, surface finish, which in the opinion of the Engineer have suffered damage either in appearance or stability owing to such cracks. The Engineer's decision as to the extent of liability of the contractor in the above matter shall be final and binding.

External crack width shall be restricted to 0.2mm on all viaduct structures. If crack width is more than 0.2mm or in the opinion of Engineer may be detrimental to concrete construction, the contractor should check the structure by his own expense.

2.13 Defective concrete

Should any concrete be found honeycombed or in any way defective, such concrete shall be cut out partially or wholly by the contractor and made good at his own expense. If Engineer feels that repaired structure will not be having same strength or shape or uniformity with other exposed surface as original desired structure/original structure, the same shall be rejected by Engineer and required to be dismantled and disposed of by contractor at his own cost, as instructed by Engineer. Decision of Engineer will be final binding in this regard.

2.14 Exposed faces, holes and fixtures

On no account shall concrete surfaces be patched or covered up or damaged concrete rectified or replaced until the Engineer or his representative has inspected the works and issued written instructions for rectification. Failure to observe this procedure will render that portion of the works liable to rejection.

Holes for foundation or other bolts or for any other purposes shall be moulded and steel angles, holdfasts or other fixtures shall be embedded, according to the drawing or as instructed by Engineer.

2.15 Finishes

Unless otherwise instructed, the face of exposed concrete placed against formwork shall be rubbed down immediately on removal of the formwork to remove irregularities. The face of concrete for which formwork is not provided other than slabs shall be smoothed with a float to give a finish equal to that of rubbed down face, where formwork is provided. The top face of a slab which is not intended to be covered with other materials shall be levelled and floated shall be done so as not to bring an excess of mortar to the surface of the concrete. The top face of a slab intended to be surfaced with other material shall be left with a spaded finish. Faces of concrete intended to be plastered shall be roughened by approved means to form of a key.

2.16 Concrete for flooring on grade

Concrete for flooring on grade shall be placed in alternative bays not exceeding more than 4m * 4m or as specified in the drawings including forming the joints or adjacent bays. The stiff mix shall be thoroughly vibrated and finished to receive the floor finish.

2.17 Grouting of base plates and bolt holes

2.17.1 Mixing

Dry grout should be mixed in a mechanical mixer: the conventional 200/400 litre capacity concrete mixer can be used to mix 4 bags of dry grout: alternatively, paddle type mortar mixers can be used. The quantity of grout to be mixed at one time should not exceed that amount which can be placed in approximately 10 to 15 minutes.

2.17.2 Batching

Batching of grout by fraction of bag is not allowed. The quantity of mixing water should be the minimum commensurate with workability, compaction and filling of the grout in all corners and crevices. Mixing should be done for a minimum of 3 minutes to obtain a fluid grout of uniform consistency.

2.17.3 Cleaning and preparation of the surface

The base concrete should be clean and strong. And its surface should be properly hacked: all dust should be removed by suction or compressed air. The surface should be thoroughly wetted with water for several hours. Before the grout is poured, all free water should be removed and the flat surfaces coated with thin cement slurry.

2.17.4 Restraint

Heavy backup blocks of timber or concrete should be fixed on all sides of the base plate to prevent escape of the grout, when poured through the openings provided in the base plate. Adequate restraint must be ensured on all the sides for a period of 7 days to obtain effective expansion and shrinkage compensation.

2.17.5 Curing

The grout should not dry out where external restraint is provided in the form of form-work, the top opening and all stray openings should be covered with wet sack for at least 7 days.

2.17.6 Placing and compaction

The grout should be placed quickly and continuously either through the holes in the base plates or from one side only to ensure complete filling without entrapment of air. Grout should be properly spread and compacted by rodding. Excessive vibration should be avoided.

Below the bed plates, the grout should be compacted using long pieces of doubled over flexible steel strapping or chains. The forward and backward movement of the strap or chain will assist in the flow of the grout into place. Steps must be taken to keep the grout in full contact with the underside of the bedplate until the grout sets: maintaining a small head of fresh grout in the forms.

2.17.7 Shrinkage compensated grout

Shrinkage compensated grout or non-shrinkable grout of associated cement companies limited or any other approved manufacturer (fosroc, roff, sikka, etc) should be used. The batching shall be as per the manufacturer's specifications, other procedures being as above.

2.18 Pre-cast concrete

The provision in this section shall be considered supplementary to general provisions for reinforced concrete works.

2.18.1 Handling and storage

The precast units shall be stored as directed by the Engineer. The area intended for the storage of precast units should be surfaced in such a way that no unequal settlement can occur.

To prevent deformation of slender units, they should be provided with supports at fairly close intervals and should also be safeguarded against tilting. Lifting and handling positions should conform to the Engineer's directions and drawings. In addition, location and orientation marks should be put on the members, as and where necessary. During erection the precast units should be protected against damage caused by local crushing and chafing effects of lifting and transport equipment.

2.18.2 Temporary supports and connections

Temporary supports provided during erection should take into account all construction loads likely to be encountered during the completion of joints between a combination of precast and in-situ concrete structural elements. The supports should be arranged in a manner that will permit the proper finishing and curing of any in-situ concreting and grouting associated with the precast member being supported when the gaps of joints have to be filled with concrete or mortar. They should first be cleaned and faces of the joints should be wetted. The mixing, placing and compacting of cement and mortar should be done with special care. Mortar of a dry consistency should be in the proportion of 1:1 ½☹1 part of cement to 1 ½ parts of sand) and should be placed in stages and packed hard from both sides of the joint.

2.18.3 Tolerances

The following tolerances apply to finished precast products at the time of placement in the structure. The forms must be fabricated /constructed to give a casting well within these limits:

Overall dimensions of members should not vary by more than +-6mm per 3m length with a maximum variation of +-20mm

Cross-sectional dimensions should not vary by more than the following:

+-3mm for sections than 150mm thick

+-4mm for sections over 150mm and less than 450mm

+-6mm for sections over 450mm to 1000mm

+-10mm for sections over 1000nn

Deviation from straight line in long sections should not be more than +-6mm up to 3m, +10 mm for 3m to 6m, +12mm for 6m to 12m.

2.19 Additional specifications for pumped concrete

2.19.1 Coarse aggregates

The maximum size of coarse aggregates shall be limited to one-third of the smallest inside diameter of the hose or pipe used for pumping. Provision shall be made for elimination of over-

sized particles by screening or by careful selection of aggregates. To obtain proper gradation it may be necessary to combine and blend certain fractional sizes of aggregates. Uniformity of gradation throughout the entire job shall be maintained.

The quantity of coarse aggregate shall be such that the concrete can be pumped, compacted and finished without difficulty.

2.19.2 Fine Aggregates

The fine aggregate to be used for the work should be “River sand” conforming to zone-|| as per IS-383. The quality and acceptance criteria should be followed as per IS-383/1970 with latest correction slips. The decision of Engineer in this respect shall be final. The silt content of fine aggregate used for trial mixes shall be recorded & the silt content in fine aggregate used shall not exceed 8%. The tests acceptance criteria for fine aggregates shall be same as per CPWD specifications.

2.19.3 Pumping of concrete

Only approved pumping equipment, in good working condition, shall be used for pumping of concrete. Concrete shall be pumped through a combination of rigid pipe and heavy-duty flexible hose of approved size and make. The couplings used to connect both rigid and flexible pipe sections shall be adequate in strength to withstand handling loads during erection of pipe system, misalignment and poor support along the lines. They should be nominally rated for at least 3.5 MPa pressure and greater for rising runs over 30m. Couplings should be designed to allow replacement of any section without moving other pipe sections, and should provide full cross section with no construction or crevices to disrupt the smooth flow of concrete.

All necessary accessories such as curved sections of rigid pipe, swivel joints and rotary distributors, pin and gate valves to prevent backflow in the pipe line, switch valves to direct the flow into another pipe line, connection devices to fill forms from the bottom up, extra strong couplings for vertical runs, transitions for connecting different sizes of pipe, air vents for downhill pumping, clean out equipment etc. shall be provided as and where required. Suitable power-controlled booms or specialized crane shall be used for supporting the pipe line.

2.19.4 Planning

Proper planning of concrete supply, pump locations, line layout, placing sequence, and the entire pumping operation for a particular pour shall be made and got approved. The pump should be as near the placing area as practicable, and the entire surrounding area shall have adequate bearing strength to support concrete delivery pipes. Lines from pump to the placing area should be laid out with a minimum of bends. For large placing area, alternate lines should be installed for rapid connection when required. Standby power and pumping equipment should be provided to replace initial equipment, should breakdown occur.

The placing rate should be estimated so that concrete can be ordered at an appropriate delivery rate.

As a final check, the pump should be started and operated without concrete to be certain that all moving parts are operating properly. A grout mortar should be pumped into the lines to provide lubrication for the concrete, but this mortar shall not be used in the placement. When the form is nearly full, and there is enough concrete in the line to complete the placement the pump shall be stopped and go-devil inserted and shall be forced through the line by water under pressure to clean it out. The go-devil should be stopped at a safe distance from the end of the line so that the water in the line will not spill into the placement area. At the end of placing operation, the line shall be cleared in the reverse direction.

2.20 Additional specifications for concrete M60 and above

2.1 Any of the following shall be permitted to be used as part replacement of ordinary Portland cement with approval from Engineer.

Micro silica/ silica frame
Fly ash
Granulated slag

However, the cement content excluding any mineral admixtures shall not exceed 450kg/cum except with the prior approval from Engineer.

Also cement content + binder should not be less than 380kg/cum of concrete

The water/ (cement + binder) ratio should generally not exceed 0.33, but in no case more than 0.40

2.2 In order that the performance of the completed structure be consistent with the requirements and assumptions made during planning and design, stringent quality assurance measures shall be taken. The methods and procedures of quality system shall follow the guidelines contained in IRC: SP:47-1998. Q-4 class of quality assurance shall be adopted for the 'materials and workmanship items.

2.3 The temperature of concrete at the time of placement shall not exceed 30-degree C. The temperature of concrete at the mixing stage should be lower, to allow for rise in temperature during transport. When considerable distance of transport is involved, particular attention should be paid to ensure retention of slump as targeted for placement.

2.4 Use of Micro silica / silica frame

a. Mineral admixture in the form of micro silica or condensed silica fume shall be permitted in the design mix. It shall comply with ASTM C 1240 'specifications for silica fume for use in hydraulic cement concrete and mortar'. It shall be obtained from proven, reliable and approved manufacturer/supplier to the satisfaction of the Engineer.

b. Adequate and complete dispersal of the micro silica during the concrete mixing shall be ensured

c. When micro silica is used in powder form the contractor shall take all precautions against potential health hazards during handling of the material.

d. Chilled water and/ or shall be used in the concrete mix depending on the ambient temperature, dimensions of the concrete element, rate of pouring and design mix constituents.

e. Special profuse curing arrangements shall be made for dissipation of the heat of hydration. The water curing shall be continued for a period of 21 days.

f. The concrete design mix and arrangement for mixing, transportation, and curing of concrete shall be subject to the approval of the Engineer.

2.5 Use of fly ash

a. Use of well-graded fly ash from an approved source may be permitted subject to satisfying the design criteria and requirement of mix design. Combination of micro silica/silica fume and fly ash may be used to improve upon the durability of concrete and getting the early strength as required however the contents of fly ash or fly ash + micro silica / silica fumes in the mix shall not be more than 35% of the total cementatious material(cement + fly ash or cement + fly ash + micro silica / silica fumes as the case may be) the maximum allowable

content of the fly ash or fly ash + micro silica / silica fumes shall be limited to 150 kg per cum of concrete mix.

b. Saving in the cement contents due to this vis vis the mix design without the using fly ash shall be passed on to the employer.
c. Fly ash shall be confirming to IS: 3812(part-1):2003 and IS: 269-1989. Contractor shall have to make sure of availability of fly ash of consistent quality and in required quantity.
d. The physical requirements for fly ash are as under:

Sl.No.	Characteristics	Requirement
1	Fineness-specific surface in m3/kg by Blaine's Permeability method,(minimum)	320
2	Particles retained on 45 microns IS sieve (wet sieving) in percent, (maximum)	34
3	Lime reactivity – average compressive strength in N/mm2 (minimum)	4.5
4	Compressive strength at 28 days' in N/mm2 (minimum)	Not less than 80 percent of the strength of corresponding plain cement mortar cubes
5	Soundness by autoclave test expansion of specimen in percent (maximum)	0.8

e. Source of fly-ash

To ensure the good quality of fly ash for use in concrete, the following sources of ash should be avoided:
Ash from plants burning different coal or blends of coal
Ash from plants burning other fuels (wood chips, tyres trash) blended with coal
Ash from start-up or shut down phases of operation
Ash from plants not operating at a 'steady state'
Ash that is handled and stored using a wet system
Unprocessed ash from power plant without electrostatic precipitator (ESP)

f. Drying and conditioning of fly ash

When used in as a partial replacement for Portland cement in ready mix concrete, fly ash must be in dry form and as such requires no processing, provided above source control is maintained.

g. Quality control

i. Fly ash in concrete should be consistent and uniform as possible. Fly ash to be used in concrete should be monitored by quality assurance/quality control (QA/QC) programed on lot basis. These procedures include performing tests for fineness by wet sieving at 45-micron sieve and loss on ignition (LOI) so that the consistency of a fly as source can be certified.

ii. Contractor shall have to evolve a suitable mix design on fly ash or fly ash + micro silica / silica fume (as the case may be) for the specified compressive/flexural strength and also demonstrate the suitability of the mix by field tests.

iii. Concrete mixes are designed by selecting the proportions of the mix components that will develop the required strength, produce a workable consistency concrete that can be handled and paved easily, attend sufficient durability under exposure to in service environmental conditions. Procedures for proportioning fly ash or fly ash + micro silica / silica fume (as the case may be) concrete mixes differ slightly from those called conventional concrete mixes.

iv. One mix design approach commonly used in proportioning fly ash or fly ash + micro silica / silica fume (as the case may be) concrete mixes is to use mix design with all Portland cement. Increase the total cementitious materials content (normally by 12%) remove some of the Portland cement and then add fly ash or fly ash + micro silica / silica fume (as the case may be) to compensate for the cement removed. Also, water content should be reduced by 5%. The ACI mix proportioning guidelines recommend a separate trial mix for each 5% increment in the replacement of Portland cement by fly ash.

v. When fly ash is used as a separately batched material, trial mixes should be made using a water (cement + fly ash) W/C+F) ratio, sometimes referred to as water cementitious ratio, instead of the conventional W/C ratio.

vi. Also relaxation shall be given in such cases from 28days strengths as 56days strength shall also be tested for compliance. Maximum cement content should be 250 kg per cum. Of concrete.

h. It shall be the responsibility of the contractor to procure and to transport and to store the fly ash to batching plant site. Contractor may also have to make nece3ssary modifications in the batching plant to enable use of fly ash in the concrete mix.

i. Fly ash handling and storage

When fly ash is used as cementitious material, the contractor should handle fly ash in the same manner as Portland cement, except that fly ash must be stored separately from the Portland cement. Loading, transportation, unloading including handling of fly ash shall be done in eco-friendly manner so as not to pollute/ degrade the atmosphere. The safety of the persons handling the fly ash should be ensured as per the approved norms.

j. Curing

i. Slower strength development of concrete containing fly ash may require that the moisture is retained in the concrete for a longer period of time than what is normally required for conventional concrete. Proper application of a curing compound should retain moisture in the concrete for sufficient period of time to permit strength development. Normal curing practices should be adequate for concrete containing fly ash.

ii. Scheduling of pavement construction should allow adequate time for the desired or specified gain prior to the placement of traffic loads.

2.21 Measurement

All linear dimensions shall be measured correct to 1cm & restricted to design dimensions, and the volume calculation will be correct to 2 decimal places in cubic metre

No deduction shall be made for volume of steel embedded in concrete or for voids not exceeding 0.03 cum in volume

3. Form Work

3.1 General

These specifications shall be read in conjunction with the MORTH specifications and CPWD specifications 1996/2002 with correction slips/amendments up to date, and other relevant specifications described in the section 1 of these specifications.

3.2 Materials

Formwork shall be a timber, plywood (including marine plywood) steel or any other suitable material capable of resisting damage to the contact faces under normal conditions of erecting forms, fixing steel and placing concrete. The selection of materials suitable for formwork shall be made by the contractor based on the quality consistent with the specified finishes and safety. For designated areas prominently in public view like piers, pier caps, portals, viaduct (cast-in-situ or precast) parapet, columns etc., only steel shuttering shall be used. The material shall be approved by the Engineer before erected at site. However, the entire responsibility of planning, designing, erecting, dismantling, shifting, and safety of false work lies with the contractor.

All formwork and formwork supports (centring, props, scaffolds, ladders, etc.) shall be in structural steel only and preferably of pipes conforming to IS: 806, IS:1161, IS:1239, IS:2750 wooden ballies shall not be permitted as props/formwork supports. All props shall be properly braced using x & k bracings. Ladders to be used at site should have treads and shall be fabricated from structural steel. Wooden/bamboo/aluminium/pipe ladders shall not be permitted.

a. Timber

Timber used for formwork shall be easily workable with nails without splitting. It shall be stable and not liable to wrap when exposed to sun and rain or wetted during concreting.

b. Plywood

Plywood used for formwork shall be minimum 12mm thick. Shuttering quality plywood complying with IS:4990 and of make approved by the Engineer. Suitable stiffeners and walers shall be provided depending on the shuttering design.

c. Steel

Steel formwork shall be made of minimum 4mm thick black sheets stiffened with angle iron frame made out of MS angles 40mm*6mm supported at suitable spacing.

3.3 Design & drawings

All temporary works such as formwork, false work, staging, launching girder, cantilever form traveller scheme etc. shall be designed by the contractor. The permissible stresses in materials of formwork, false work, staging, launching girder & cantilever form traveller shall be same as for permanent structure. All calculations and drawings of the same including construction sequence shall be checked and verified by independent agency appointed by contractor. Only after the checking of the same, the calculations and drawings (along with soft copy in CD ROM) shall be submitted to the Engineer for approval well in advance of work.

All temporary works shall be also inspected by the independent agency and independent report shall be submitted to Engineer. All temporary works shall be robust, safe and constructed such a way that the concrete can be properly placed and thoroughly compacted to obtain the required shape, position and level; subject to specified tolerances. It is the responsibility of the contractor to obtain the results required by the Engineer, whether or not some of the work is sub-contracted. Approval of the temporary works by the Engineer shall not diminish the contractor’s responsibility for the satisfactory performance of the same, nor for the safety and co-ordination of all operations.

For pier formwork, it shall be ensured that total deflection (taking account of combined deflection of plate, stiffness, walers or any other supporting arrangement) shall not be more than 3mm.

All the formwork, launching truss and cantilever form traveller and other selected temporary works shall be tested for the load including factor of safety for which the truss/formwork is designed before use in works at no extra cost.

The design of false work should be such as to facilitate easy and safe access to all parts for proper inspection.

Methodology for removal of form should be planned as a part of total form work design process.

In case of pre-stressed concrete work, careful consideration shall be given to re-distribution of loads due to pre-stressing.

3.4 Formwork for exposed concrete surfaces

The facing formwork, unless indicated otherwise in drawings or specifically approved by the Engineer in writing, shall generally be made with materials not less than the thickness mentioned below for different elements of the structure:

1. Plain slab soffit, and sides of beams, girders, joists and ribs and side of walls, fins, parapets, pardis, sun-breakers, etc. shall be made with:

   a. Steel plates not less than 4mm thick of specified sizes stiffened with a suitable structural framework and fabricated true to plane

   b. Timber planks of 20mm actual thickness and of specified surface finish, width and reasonable length.

   c. Plywood not less than 12mm thick (IS:4990- specification for plywood for concrete shuttering work) stiffened with a suitable timber frame work or 3mm thick plywood with a 20mm timber plank backing, of specified sizes stiffened with a suitable timber framework and bracing. At joints 6mm/10mm sponge to be provided.

2. Bottoms of beams, girders and ribs, sides of columns shall be made with steel plates not less than 5mm thick of specified sizes stiffened with a suitable structural framework, and fabricated true to plane.

   a. Timber planks of 35mm actual thickness and of specified surface finish, width and reasonable length.

   b. Plywood not less than 12mm thick (IS:4990) of specified sizes stiffened with a suitable timber framework.

3. For precast segments, piers, pier heads, portals etc. suitable steel formwork is to be used unless otherwise specified by Engineer.

3.5 Formwork for sloped surfaces

a. Forms for sloped surfaces shall be built so that the formwork can be placed board-by-board immediately ahead of concrete placement so as to enable ready access for placement, vibration, inspection and finishing of the concrete.

b. The formwork shall be built in such a way so that the boards can be removed one by one from the bottom up as soon as the concrete has attained sufficient stiffness to prevent sagging. Surfaces of construction joints and finished surfaces with slopes steeper than 2 horizontals:1 vertical shall be formed as required herein.

3.6 Formwork for curved surfaces

a. The contractor shall interpolate intermediate sections as necessary and shall construct the forms so that the curvature will be continuous between sections. Where necessary to meet requirements for curvature, the form lumber shall be built up of laminated splices cut to make tight, smooth form surfaces.

b. After the forms have been constructed, all surface imperfections shall be corrected and all surface irregularities at matching faces of form material shall be dressed to the specified curvature.

3.7 Erection of formwork

The following shall apply to all formwork:

a. To avoid delay and unnecessary rejection, the contractor shall obtain the approval of Engineer for the design of forms and type of material used before fabricating the forms. (Ref. ACI 347 formwork for concrete or equivalent IS code)

b. All shuttering planks and plates shall be adequately backed to the satisfaction of the Engineer by a sufficient number and size of walers or framework to ensure rigidity during concreting. All shutters shall be adequately strutted, braced and propped to the satisfaction of the Engineer to prevent deflection under deadweight of concrete and superimposed live load of workmen, materials and plant, and to withstand pouring rate and vibration.

c. Vertical props shall be supported on wedges or other measures shall be taken so that the props can be gently lowered vertically during removal of the formwork. Props for an upper level shall be placed directly over those in the level immediately below, and the lowest props shall bear on a sufficiently strong area. Care shall be taken that all formwork is set plumb and true to line and level or camber or better where required and as specified by the Engineer.

d. Provision shall be made for adjustment of supporting struts where necessary. When reinforcement passes through the formwork care should be taken to ensure close fitting joints against the steel bars so as to avoid loss of fines during the compaction of concrete.

e. If the formwork is held together by bolts, these shall be fixed that no iron will be exposed on surfaces against which concrete is to laid and within the concrete cover to the steel reinforcement. In case wires shall not be used with exposed concrete formwork. The Engineer may at his discretion allow the contractor to use tie-bolts running through the concrete and the contractor shall decide the location and size of such tie-bolts in consultation with Engineer. The tie-bolts shall be so designed that their removal on de-shuttering does not leave any embedment with in the concrete cover to steel reinforcement. Holes left in the methodology as approved by the Engineer at no extra cost.

f. Provisions shall be made in the shuttering for beams, columns, and walls for a port hole of convenient size so that all that may be collected could be removed just prior to concreting.

g. Formwork shall be so arranged as to permit removal of forms without jarring the concrete. Wedges, clamps and bolts shall be used wherever practicable instead of nails.

h. The formwork for beams and slabs shall be so erected that forms on the sides of the beams and the soffit of slabs can be removed without disturbing the beam bottoms or props under beams.

    1. Surfaces of forms in contact with concrete shall be oiled with a mould oil of approved quality form releasing agent. If required by the Engineer the contractor shall execute different parts of the work with different mould oils to enable the Engineer to select the most suitable. The use of mould oil and any other lubricating oil shall not be allowed. Mould oil shall be applied before reinforcement has been placed and care as to be taken that no oil comes in contact with the reinforcement while it is being placed in position. The formwork shall be kept thoroughly wet during concreting and the whole time that is left in place. Nothing extra shall be paid to contractor for oiling the moulds.

    2. Immediately before concreting is commenced, the formwork and other related arrangements shall be carefully examined to ensure the following:

3. Removal of all dirt, shavings, sawdust and other refuse by brushing, washing and compressed air/vacuum cleaning.
4. The tightness of joints between panels of sheathing and between these and any hardened core.
5. The correct location of tie bars, bracing and spacers, and especially connections of bracing.
6. Adequate cover blocks are in place
7. Straightness and plumb line of the form work
8. Side supports/restraints for the form work are enough and robust
9. Construction joint (wherever applicable) is properly prepared
10. That all wedges are secured and firm in position
11. The provision is made for traffic on formwork not to bear directly on reinforcing steel.
12. Pouring platform along with its approach from ground is robust and safe for worker's movement
13. Arrangement for vibrators for compaction of concrete
14. Sequence of concrete pouring is well defined and is agreed upon by the Engineer and is explained to concrete pouring team
15. The pouring area is well it
16. Curing arrangements are well planned and agreed upon by the Engineer
17. The green concrete protection measures from sun & rain etc. are in place.
18. The contractor shall obtain the Engineer's approval for dimensional accuracies of the work and for the general arrangement of propping and bracing. (IS:3696- safety code of scaffolds and ladders, IS:4014 steel tubular scaffolding 1 & 2) all scaffolding and staging shall be either of steel tubes or built up section of rolled steel with adequate bracing at several levels in each perpendicular direction connecting each prop. In addition to this diagonal bracing should be provided in elevation ideally at 45 degrees or between 30 and 60 degrees. The contractor shall be entirely responsible for adequacy of propping, and for keeping the wedges and other locking arrangements undisturbed through the de-centring period. (IS: 8989 safety code for erection of concrete framed structures)
19. Formwork shall be continuously watched during the process of concreting. If during concreting any weakness develops and formwork shows any distress the work shall be stopped and remedial action as directed by the Engineer shall be taken.
20. Staging for portal girder and cross girder (in station zone) shall be in the form of portal frame. It shall be ensured that minimum two lanes of traffic with a restricted height of 4.5m can ply underneath it with adequate protection to portal legs from moving traffic.

3.8 Concrete finishes

This section deals with the surface of concrete on which forms had been fixed while concreting.

1. **Formed surface**

Allowable deviation from plumb or level and from the alignment profile, grades and dimensions shown on the drawings is defined as 'tolerance' and is to be distinguished from irregularities in finishes as described herein. Tolerances in concrete construction are specified elsewhere.

The classes of finish and requirements for finishing of concrete surface shall be as shown on the drawings or as hereinafter specified. In the event of finishing not being definitely specified herein or in the drawings, finishes to be adopted shall be as directed by the Engineer

Completed concrete surface shall be tested, where necessary to determine whether surface irregularities are within the limits specified hereinafter.

Surface irregularities are classified as 'abrupt' or 'gradual'. Offsets caused by displaced and misplaced form sheathing, or form sections or by loose knots or otherwise defective timber form will be considered as abrupt irregularities, and shall be tested by direct measurements. All other irregularities shall be considered as gradual irregularities and will be tested by use of template, consisting of a straight edge or the equivalent thereof for curved surfaces. The length of the template, consisting of a straight edge or the equivalent thereof for curved surfaces. The length of the template shall be 150cm for testing of formed surfaces and 300cm for testing of unformed surfaces.

The classes of finish for formed concrete surfaces are designated by one of the symbols F1, F2, F3 and F4. Unless otherwise specified or indicated on drawings, these classes of finish shall apply as follows:

Finish F1: This finish applies to surfaces where roughness is not objectionable, or surface that will otherwise be permanently concealed. Surface treatment shall be the repair of defective concrete, correction of surface depressions deeper than 25mm and filling of tie rod holes. Form sheathing will not leak mortar when concrete is vibrated. Forms may be manufactured with a minimum of refinement.

Finish F2: This finish is required on surfaces permanently but not prominently exposed to public view for which other finishes are not specified except F1. Forms shall be manufactured in a workmanlike manner to the required offsets or bulges. Surface irregularities shall not exceed 5mm for abrupt and 8mm for gradual irregularities measured with a 1.5m template.

Finish F3: This finish is required for coarse textured concrete surfaces intended to receive plaster, stucco or wainscoting. Surface irregularities shall not exceed 5mm for both abrupt and gradual irregularities.

Finish F4: This finish is designated for surfaces prominently exposed to public view where appearance is also of special importance. This shall include piers of bridges, viaducts, beams, parapets, railings and decorative features on the structure and on the bridges. To meet with requirements for F4 finish, forms shall be manufactured in a skilful, workmanlike manner, accurately to dimensions. There should be no visible offsets, bilges or misalignment of concrete. At construction joints, the forms shall be rightly set and securely anchored close to the joint. Abrupt and gradual irregularities shall not exceed 3mm. irregularities exceeding this limit shall be reduced by grinding to a level of 1:20 ratio of height to length. Jute bag subbing or sand blasting shall not be used.

2. Unformed surfaces

The classes of finish for unformed surfaces are designated by symbols U1, U2, U3 and U4. Unless otherwise specified or indicated on drawings, these classes of finish shall apply as follows:

Finish U1: This finish applies to unformed surfaces that will be concealed permanently or otherwise where a screed surface finish meets the functional requirements. Finish U1 is also used as the stage of finishes for U2 & U3. Finishing operations shall consist of sufficient levelling and screed to produce an even uniform surface. Surface irregularities shall not exceed 10mm.

Finish U2: This is floated finish, and used on all outdoor, unformed surfaces. Finish U2 is also used as second stage of finish for U3. Floating to be performed manually or mechanically on stiffened screed surface shall be continued till a small amount of mortar without excess water is brought to the surfaces so as to permit effective trowelling, surface irregularities shall be removed as directed by Engineer.

Finish U3: This is a trowelled finish and shall be used for tops of parapets, etc. prominently exposed to view. When the floated surface has hardened sufficiently, steel trowelling shall be started. Steel trowelling on hardened, floated surface shall be performed with firm pressure to produce a dense uniform surface free from blemishes and trowel marks and having slightly glossy appearance. Surface irregularities shall not exceed 5mm.

Finish U4: This is a steel-trowelled finish, similar to finish U3, except that light surface pitting and light trowel marks such as obtained from the use of machine trowelling will be acceptable, provided that surface irregularities do not exceed the limits specified for finish U3.

Unformed surfaces which are nominally level shall be sloped for drainage as shown on drawings or as directed by Engineer unless the use of other slopes or level surface is indicated on drawings. Narrow surface such as tops of parapets, walls and kerbs shall be sloped approximately 1cm per 30cm of width. Broader surface such as roadways, platform, and decks, shall be sloped approximately ½ cm per 30cm of width. Finishes of floor and roof slabs shall be sloped, if required by Engineer.

3.9 Exposed concrete work

Exposed concrete surfaces shall be smooth and even, originally as stripped without any finishing or rendering. Where directed by the Engineer, the surface shall be rubbed with carborundum stone immediately on striking the forms. The contractor shall exercise special care and supervision of formwork and concreting to ensure that the cast members are made true to their sizes, shapes and positions and to produce the surface patterns desired. No honeycombing shall be allowed. Honeycombed parts of the concrete including the other surface defects in the concrete shall be removed by the contractor as per the methods, which do not affect strength of adjoining concrete and as approved by the Engineer.

Part of defective concrete thus removed shall be re-cast using fresh concrete of same grade or approved quality concrete repair material depending upon the size, location, thickness of the defective concrete and structural behaviour of the member having defective concrete as instructed by the Engineer without extra cost, for the purpose the contractor shall prepare a comprehensive work procedure and get it approved from the Engineer. Nothing extra shall be paid for repair of the concrete. Contractor shall ensure that no air bubbles are formed on the exposed surface. Concrete pouring sequence, vibration, methodology etc. shall be planned to

avoid air bubble. All materials, sizes and layouts of formwork including the locations for their joints shall have prior approval of the Engineer.

3.10 Age of concrete at removal of formwork

In accordance with CPWD specifications 1996/2002 or IS:456. The Engineer may vary the periods specified if he considers it necessary. Immediately after the forms are removed, they shall be cleaned with a jet of water and a soft brush.

3.11 Stripping of formwork

The work of formwork removal should be planned and a definite scheme of operation worked out. Formwork shall be removed carefully without jarring the concrete, and curing of the concrete shall be commenced immediately. / concrete surfaces to be exposed shall, where required by the Engineer, be rubbed down with carborundum stone or bush-hammer to obtain a smooth and even finish. Where the concrete requires plastering or other finish later the concrete surface shall be immediately hacked lightly all over using approved methods and as directed by the Engineer. No extra charge will be allowed to the contractor for such work on concrete surfaces after removal of forms.

3.12 Reuse of forms

The contractor shall not be permitted reuse of timber facing formwork brought new on the works for more than 5 times for exposed concrete for formwork. 5 or 8 uses shall be permitted only if forms are properly cared for, stored and repaired after each use. The Engineer may at his absolute discretion order rejection of any forms he considers unfit for use for a particular item irrespective of no. of items the shuttering has been used and order removal from the site of any forms he considers unfit for use in the works. Used forms brought on the site will be allowed proportionally fewer uses depending upon its condition and as decided by the Engineer. Use of different quality boards or the use of old and new boards in the same formwork shall not be allowed. If any other type of special or proprietary form work is used, the no. of times they can be used will be determined by the Engineer

3.13 Formwork for precast/pre stressed concrete

The provisions in this section shall be considered supplementary to the general provisions stated above and additional technical specifications for precast segments. Precast concrete members and panels shall be made in accurately constructed moulds, on a properly prepared casting bed. All aspects of making, curing and erection of precast units shall be subject to the approval of Engineer.

The contractor shall submit detailed drawings of formwork for the approval of the Engineer. Finishing with cement mortar shall not be allowed.

The formwork should be so designed that it does not restrain the shrinkage movements and possible shortening due to pre-stress of the concrete. The formwork shall be of sturdy construction with special considerations to shutter vibrators when used. All edges and joints of the formwork should be designed and sealed so that no cement grout can escape and there is no wedging or keying to the concrete. The effect of curing on formwork should be given special consideration. Depending on care, curing, erection and maintenance of the formwork after stripping, the following no. of uses can be made with different typed of formwork

Plywood with timber backed formwork – as per satisfaction of Engineer
Steel moulds - as per satisfaction of Engineer

In case concrete moulds can be satisfactory provided by the contractor, the Engineer's approval shall be obtained before use on the works.

1. Stripping

As soon as the precast units have attained sufficient strength, the formwork shall be stripped. The precast unit shall be lifted uniformly out of the formwork without being subjected to tilting or restraint effects.

3.14 Special architectural finishes

Special approved architectural finishes like grooves, logos, engravings/projections in inset and out set as per the approval design shall be provided by fixing monolithic rubber forms or any other approved material fixed on the entire surface of the form work. The shore hardness of the rubber shall be 600 5A to ensure strength, flexibility and elasticity. The rubber shall be cold cured (preferably polyurethane based) and fixed to the formwork under controlled conditions in shade and air temperature not exceeding 280 C.

The form liners should be shrinkage free, solvent free and should be impervious to abrasion by concrete, resistant to concrete pressure and heat resistant up to 700C dry heat. Formwork liner fixation should be factory made under close tolerances and stage inspections.

If proprietary system of formwork is used, detailed information as given in annexure 4.1 herein shall be furnished to Engineer for approval before use.

3.15 Measurement

Unless stated otherwise, the rate for concrete in plain concrete, reinforced concrete or in pre stressed concrete shall be deemed to include the cost of all formwork/shuttering, staging, launching, etc.

Information to be supplied by manufacturers of proprietary systems of form work

1. General

1.1 The information which the manufacture is required to supply shall be in such detail as to obviate unsafe erection and use of equipment due to the intention of the manufacture not having been made clear or due to wrong assumptions on the part of the user.

1.2 The user shall refer unusual problems of erection/assembly not in keeping with intended use of equipment, to the manufacturer of the equipment.

2. Information required

2.1 The manufacturers of proprietary systems shall supply the following information:

a. Description of basic functions of equipment.

b. List of items of equipment available, giving range of sizes, spans and such like, with manufacturers identification number or other reference.

c. The basis on which safe working loads have been determined and whether the factor of safety given applies to collapse or yield.

d. Whether the supplier's data are based on calculations and tests. This shall be clearly stated as there may be wide variations between results obtained by either method.

e. Instructions for use and maintenance, including any points which require special attention during erection, especially where safety is concerned.

f. Detailed dimensional information, as follows:

1. Overall dimensions, depths and widths of members
2. Line drawings including perspectives and photographs showing normal uses
3. Self-weight.
4. Full dimensions of connections and any special positioning and supporting arrangements.
5. Sizes of members, including tube diameters and thickness of material.
6. Any permanent camber built into the equipment.
7. Sizes of holes and dimensions giving their positions.
8. Manner of fixing including arrangements for sealing joints.
9. Method of de-stripping, storing and shifting.

g. Data relating to strength of equipment as follows:

1. Average failure loads as determined by tests
2. Recommend maximum working loads for various conditions.
3. Working resistance moments derived from tests.
4. Working shear capacity derived from tests.
5. Recommend factors of safety used in assessing recommended loads and deflections based on test results.
6. Deflections under load together with recommended pre-camber and limiting deflections.
7. If working loads depend on calculations, working stresses should be tested. If deflections depend on theoretical moments of inertia or equivalent moments of inertia rather than tests, this should be noted.
8. Information on the design of sway bracing against wind and other horizontal loadings.
9. Allowable loading relating maximum extension of bases and heads.
10. Any restrictions regarding usage of any component or full assembly with regard to spans, heights and loading conditions.

4. Reinforcement

4.1 General

These specifications shall be read in conjunction with the MORTH specifications and CPWD specifications 1996/2002 with correction slips/amendments up to date, and other relevant specifications described in the section 1 of these specifications.

Any steel specified for reinforcement shall conform in every respect to the latest relevant Indian standard specifications and shall be of tested quality under the ISI certification scheme.

All reinforcement work shall be executed in conformity with the drawings supplied and instructions given by the Engineer and shall generally be carried out in accordance with the relevant Indian standard specifications IS:2502- bending and fixing of bars for concrete reinforcement.

Only TMT reinforcing bars of grade FE550 (0.2% proof stress/yield stress not less than 550 MPa) confirming to IS:1786-1985 shall be supplied and used as reinforcement steel for the permanent work.

The reinforcement shall be from primary producers and no re-rolled steel shall be suppled and used. The contractor will produce copy of original challan/voucher as a proof of having purchased the steel reinforcement from approved manufacturer or their authorised distributors.

The steel reinforcement shall be brought to the site in bulk supply of 10 tonnes or more as decided by the Engineer. All reinforcement shall be stored horizontally above ground level on platforms, skids or other approved supports, clear of any running or standing water. Proper drainage of platform shall be provided. Steel reinforcement shall be stored in such a way as to avoid distortion and prevent deterioration by corrosion. Bars of different diameters shall be stored separately. A record shall be kept of the batch numbers of reinforcement deliveries in such a form that the part of works in which particular reinforcement is used can be readily identified.

4.2 Inspection and testing

Every bar shall be inspected before assembling on the works and any defective pitted, brittle, excessively rusted or burnt bars shall be removed. Cracked ends of bars shall be cut out.

No work shall be commenced without the Engineer’s approval of the bar bending schedule.

Manufacturer’s test certificate shall be supplied for each lot of supply brought at site of work by the contractor.

Specimens sufficient for thee tensile tests for each different size of bar, bend and re bend physical tests for each consignment delivered shall be sampled and tested by the contractor before use at site. Tests results shall be duly supported by graph. Bathes shall be rejected if the average results of each batch are not in accordance with the relevant specifications/codes and the rejected steel shall be removed from the site of work by the contractor at his own cost within a week’s time from the written order from the Engineer.

4.3 Bar bending and bar bending schedule

All bars will be carefully and accurately bent by approved means of accordance with IS:2502, and relevant drawings. It shall be ensured that depth of crank is correct as per the bar cutting and bending schedule. Bent bars are not straightened for use in any manner that will injure the material.
Prior to starting bar bending work, the contractor shall prepare bar bending schedule from the structural drawings supplied to him and get the same approved by Engineer. Any discrepancies and inaccuracies found by the contractor in the drawings shall be immediately reported to the Engineer whose interpretation and decision thereof, shall be final.

4.4 Lapping and couplers (to be used in pile caps and piers. Couplers cannot be used in precast deck)

As far as possible bars of the maximum length available shall be used. Laps shown on drawings or otherwise specified by the Engineer will be based on the use by the contractor of bars of maximum length. Payment for reinforcement shall be made only for reinforcement shown in such drawings and such laps. For bars having larger diameter more than 25mm

mechanical couplers shall be provided at the locations approved by the Engineer and no lap shall be permitted. No extra payment on account of providing mechanical couplers shall be paid.
Welding in lieu of lap is not permitted unless specified in the drawings or as instructed by the Engineer. Welding of reinforcement of piles having diameter of lesser them 25mm is permitted. Welding shall confirm to the relevant IS code.

4.5 Spacing, supporting and cleaning

All reinforcement shall be placed and maintained in the positions shown on the drawings.

The contractor shall provide approved types of supports for maintaining the bars in position and ensuring required spacing's and correct cover of concrete to the reinforcement as specified on the drawings. Cover bocks of required shape, size and strength MS chairs and spacer bars shall be used to ensure accurate positioning of reinforcement.

Cover blocks shall be cast well in advance and shall consist of approved proprietary pre-packaged free flowing mortars (conbextra HF of fosroc or equivalent) having the strength same as that of concrete for the member for which they are to be used. They shall be circular in shape for side cover and square fir bottom cover. Cover blocks shall be cured so as to achieve the desired strength. The cost of cover blocks and chairs/spacer shall be deemed to have been included in the rates.

Bars must be cleaned before concreting commences of all scale, rust or partially set concrete which may have been deposited there during placing of previous lift of concrete. Any reinforcement which is certified as corroded by the Engineer shall be removed from the site.

The HYSD bars shall be provided using cement and inhibitor using following procedure:

Cleaning of steel by wire brush for dust and rust.

Apply one coat of cement slurry [1kg cement & 600cc of inhibitor solution (patent no. 109784/67)] by dipping or brushing. Allow it to dry for 24hours in shade. The water is not to be used. The inhibitor solution is prepared in ionised water.

No extra payment shall be made for the same

18-gauge GI wire shall be used for binding reinforcement as well as for tying cover blocks with reinforcement.

4.6 Welding

Wherever specified all lap and butt welding of bars shall be carried in accordance with IS:2571. Only qualified welders duly tested and certified by the contractor shall be permitted to carry out such welding.
For cold twisted reinforcement welding operations must be controlled to prevent supply of large amounts of heat larger than that can be dissipated. The extreme non-twisted end portion shall be cut off before welding. Electrodes with rutile coating should be used.
Bars shall be free from rust at then joints to be welded.
Slag produced in welding after each run should be chipped and removed by brush.
Electrode should not be lighted by touching the hot bar.
The welding procedure shall be approved by the Engineer and tests shall be conducted to prove the soundness of the welded connection.

4.7 Provision of future catholic protection for corrosion control:

In order to provide cathodic protection in future, all reinforcement shall be tack welded using electrodes compatible with the types of bars at the specified intervals in the drawings. As guidelines, all reinforcing bars shall be tack welded at each ends or at a distance not more than

6m along length to the bars intersecting in other direction. The tack welding shall be checked for electrical continuity before concreting. This shall be measured and paid separately. There is no separate payment on account of providing welding, however, steel used shall be paid in the relevant BOQ.

4.8 Measurement

The measurement shall be done by weight in MT based on bar bending schedule using the standard sectional weight of various bars indicated below:

Sl.no	Bar diameter (mm)	Standard sectional weight in Kg/m
1	6	0.222
2	8	0.395
3	10	0.617
4	12	0.888
5	16	1.578
6	18	2.000
7	20	2.466
8	22	2.980
9	25	3.854
10	28	4.830
11	32	6.313
12	36	7.990
13	40	9.864
14	45	12.490

Payment reinforcement steel shall be made for the length of the reinforcement bars of different diameter as per approved bending schedule (to be prepared by the contractor on the basis of approved drawing) including authorised chairs/spacer bars, lap/butt welding wherever required as per clause 5.4 however, if standard laps are provided, they will be measured separately for the length shown in the drawing or for measured length of bars. In case the actual reinforcement provided in any member is less than the quantity calculated based on drawings/bar bending schedule (with the approval of Engineer), the same shall be adjusted for the purpose of payment.

Payments shall not be made for butt welding and reinforcement bars used for lifting, hooks, handling, etc. as cost towards these is deemed to be included in the accepted rate of the item.

5. CABLE TRAYS

5.1. General

Cable trays, of sizes as per schedule of quantities and drawings shall be of perforated doubled bend channel or of ladder design as specified in BOQ. Cable trays shall be fabricated from sheet steel of thickness as per BOQ and shall be complete with tees, elbows, risers, and all necessary hardware.

Trays shall be hot dip galvanized and all the accessories shall be factory fabricated, site fabricated accessories are not permitted. Cable trays shall be erected in perfect level and plumb and shall comply with the following:

Trays shall have suitable strength and rigidity to provide proper support for all the contained cables. Trays shall not have sharp edges, burrs or projections injurious to cable insulation. Trays shall include fittings such as bends, risers etc. for changes in direction and elevation. Each run of cable tray shall be completed before laying of cables. Cable trays shall be erected so as to be exposed and accessible.

This support should be capable of withstanding the entire weight of cable trays and cable contained in the trays. Additional supports are to be provided at both ends of the cable trays and at all bends. The entire cable tray system shall be rigid. Cost of support arrangement shall be included in the rates quoted for supply and installation of trays unless separately provided for in the BOQ.

Complete details of this support arrangement shall be shown in Shop Floor / working drawings to be prepared by the Contractors and approval to be obtained from Employer's representative before execution. Works shall be carried out only as per approved working drawings.

Support structure shall be fabricated from suitable size “L” Angles/Square Tubes of 6mm thick (Min). Suitable sized Anchor fasteners of reputed and approved make to be provided for installing the fabricated supports.

5.2. Inspection and testing

Each lot will be inspected by the employer and Samples will be collected for third party tests as per relevant IS Code

6. Methodology:

The proposed methodology and program of pre-casting of cable troughs, curing, stacking, transportation of precast elements to site, backed with equipment planning and deployment, duly supported with broad calculations and Quality Control procedures proposed to be adopted, justifying their capability of execution and completion of the work as per technical specifications within the stipulated period of completion.

7. Outline quality plan

The contractor shall establish and maintain quality assurance procedures for precast elements and the interfaces between them. this quality assurance system shall be applied without prejudice to, or without in any way limiting, any quality assurance systems that the contractor already maintains.

The contractor shall submit an outline quality plan which shall contain sufficient information to demonstrate clearly the proposals for achieving effective and efficient quality assurance system. the outline quality plan should include an outline of the procedures and regulations to be developed and the mechanism by which they will be implemented for ensuring quality as required by the employer's requirement.

The contractor may be requested to amplify, explain or develop its outline quality plan.

8. Outline Safety plan

a. The contractor shall submit an outline safety plan which shall contain sufficient information to demonstrate clearly the proposals for achieving effective and efficient safety procedures. the outline safety plan should include an outline of the safety procedures and regulations to be developed and the mechanism by which they will be implemented for ensuring safety.

b. The contractor may be requested to amplify, explain or develop his outline safety plan.

9. Outline Environmental plan

c. The contractor shall submit an outline environmental plan illustrating the intended means of compliance with the requirements of the employer and setting out in summary form an adequate basis for the development of the more detailed document to be submitted. the outline environmental plan shall contain sufficient information to demonstrate clearly the proposed method of achieving the tenderer's environmental objectives with regard to the requirement of the contract.

10. Tenderer's Technical proposals

The tenderers shall prepare and submit with the tender his technical proposals and should cover in detail the following:

a. Understanding and comprehension of the work involved.
b. The general approach and methodology proposed for carrying out the works covered in the scope of work to be performed for the manufacture, supply and fixing in positions including finishing of cement concrete (with 53 grade OP cement) precast cable troughs of M40 grade with twin and single cell using TMT reinforcement/mild steel bars with precast cement concrete cover slab for the stations, viaducts, crossover locations and jumper locations etc. for traction, signal and telecom cable arrangements for extensions of Reach-1 and depot entries of Bangalore Metro Rail Project Phase-II. including such detailed information as deemed relevant.
c. Tenderers work schedules - A detailed overall work program in terms of weeks from commencement date of works and a bar chart indicating the duration and timing of all major activities. bar chart shall be made showing the activity to be performed along with duration of each activity. broadly all major activities required for carrying on the work should be shown.

11. Chicken Mesh

Chicken Mesh confirming to IS Code :3150 to be provided.

Note: *The required tests to be conducted shall invariably listed in the technical specifications in reference to GCC 31 and respective Special Conditions of Contract*.

SECTION 8 – DRAWINGS

Attached

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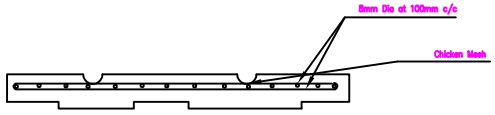
Original Drawing Size A1



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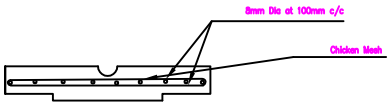

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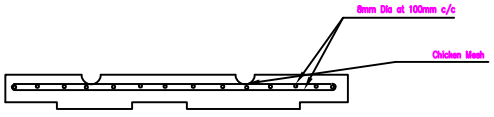
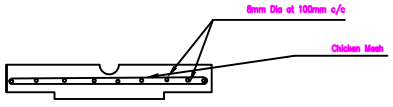
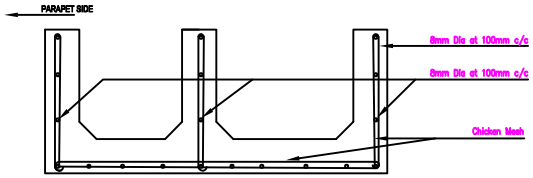


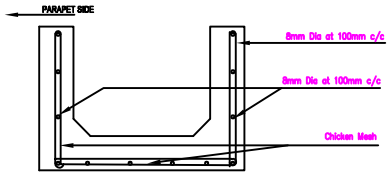
RC DETAILS OF SLAB



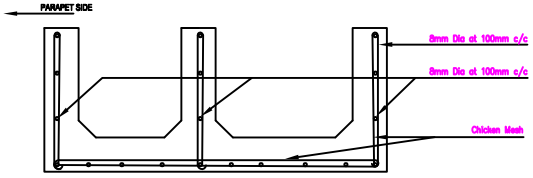
RC DETAILS OF SLAB



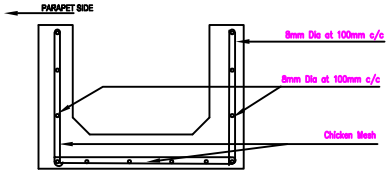
RC DETAILS OF CABLE DUCT



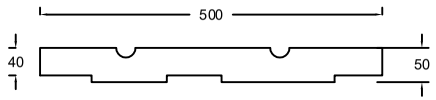
RC DETAILS OF CABLE DUCT



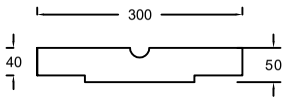
RC DETAILS OF CABLE DUCT



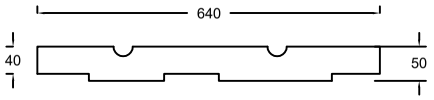
RC DETAILS OF CABLE DUCT



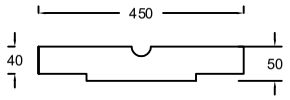
DOUBLE CABLE DUCT COVER



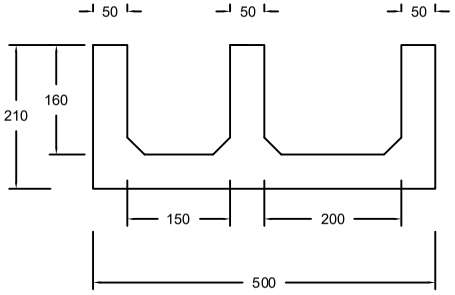
SINGLE CABLE DUCT COVER



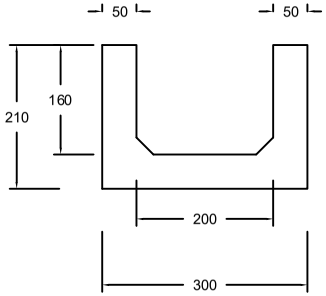
CABLE TROUGH COVER FOR DOUBLE CELL



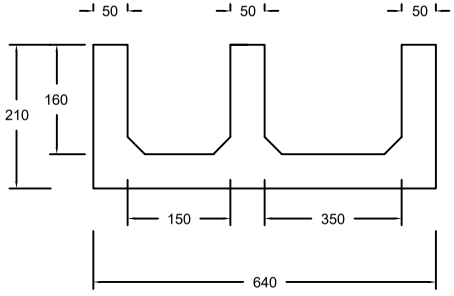
CABLE TROUGH COVER FOR SINGLE CELL



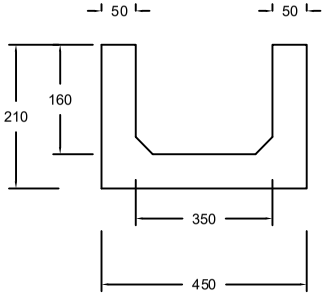
CABLE DUCT
FOR DOUBLE CABLE TROUGH



CABLE DUCT
FOR SINGLE CABLE TROUGH



DOUBLE CELL CABLE TROUGH



SINGLE CELL CABLE TROUGH

GENERAL NOTES:

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS IN METERS UNLESS OTHERWISE SPECIFIED.
2. ONLY WRITTEN DIMENSIONS SHALL BE FOLLOWED. DO NOT SCALE THE DRAWING.
3. GRADE OF CONCRETE SHALL BE M40.
4. GRADE OF REINFORCEMENT Fe 550.
5. PRECAST CABLE DUCTS ARE TO BE PLACED IN POSITION ONLY AFTER TRACK PLINTH CONCRETING.
6. CABLE DUCT COVERS TO BE PLACED IN POSITION ONLY AFTER ALL CABLING WORKS ARE DONE.
7. CABLE DUCT JOINTS ARE TO BE POINTED WIT CEMENT GROUT BEFORE COMMISSIONING OF METRO TRAIN SERVICES.
8. INTERNAL DIMENSIONS OF CABLE DUCT TO BE ENSURED.
9. WHERE EVER TURNING UNIT BOXES ARE COMING SINGLE CABLE TROUGH SHALL BE LAID.
10. LOCATION OF SINGLE/DOUBLE CABLE TROUGH SHALL BE DECIDED BASED ON E&M REQUIREMENT.

KEY PLAN

CLIENT: BANGALORE METRO RAIL CORPORATION LTD

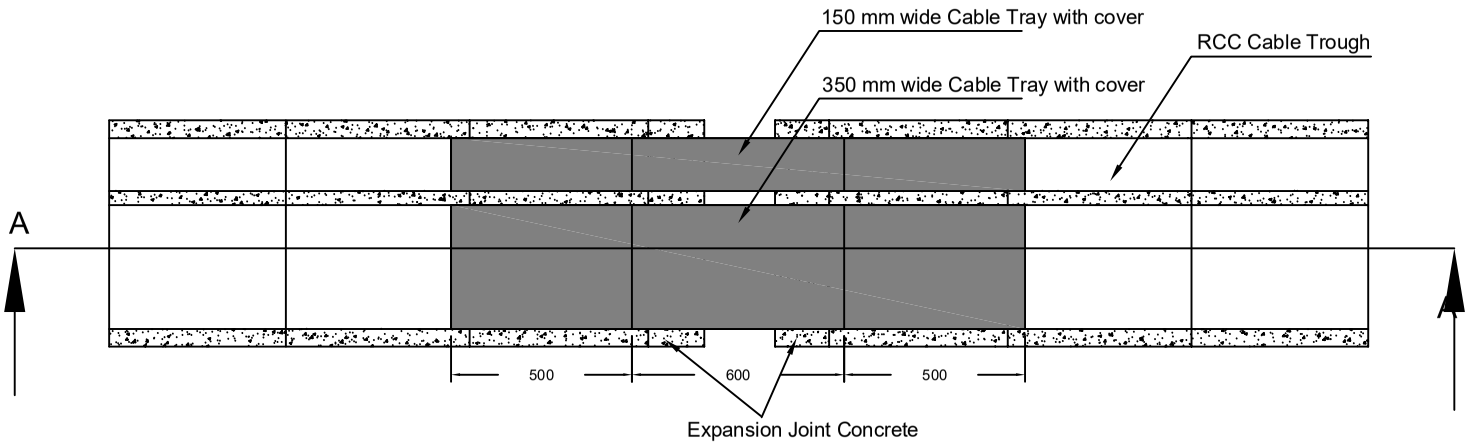
DRAWING TITLE:

DRAWING NUMBER:

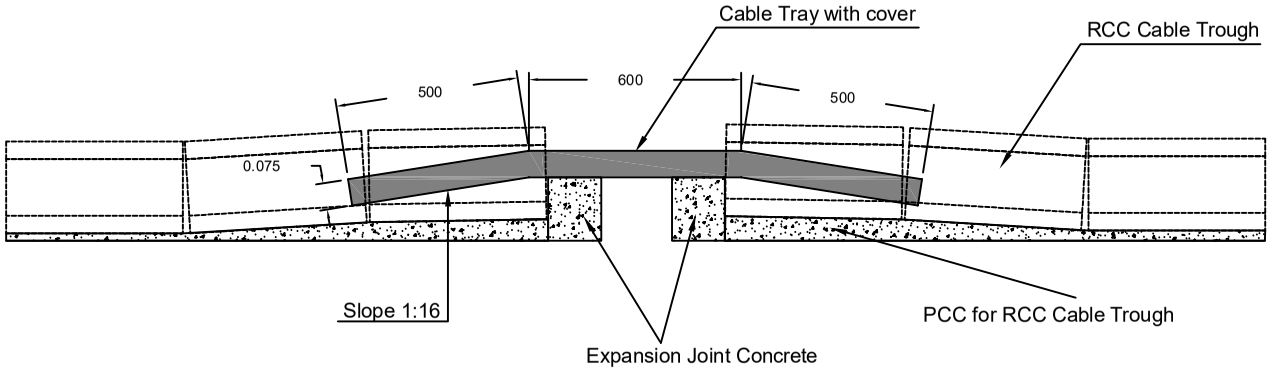
CAD FILE:

DRAWING STATUS	
As Built (B)	
Working Drawing (W)	✓
CRD (C)	
Definitive Design (D)	
Preliminary Design (P)	

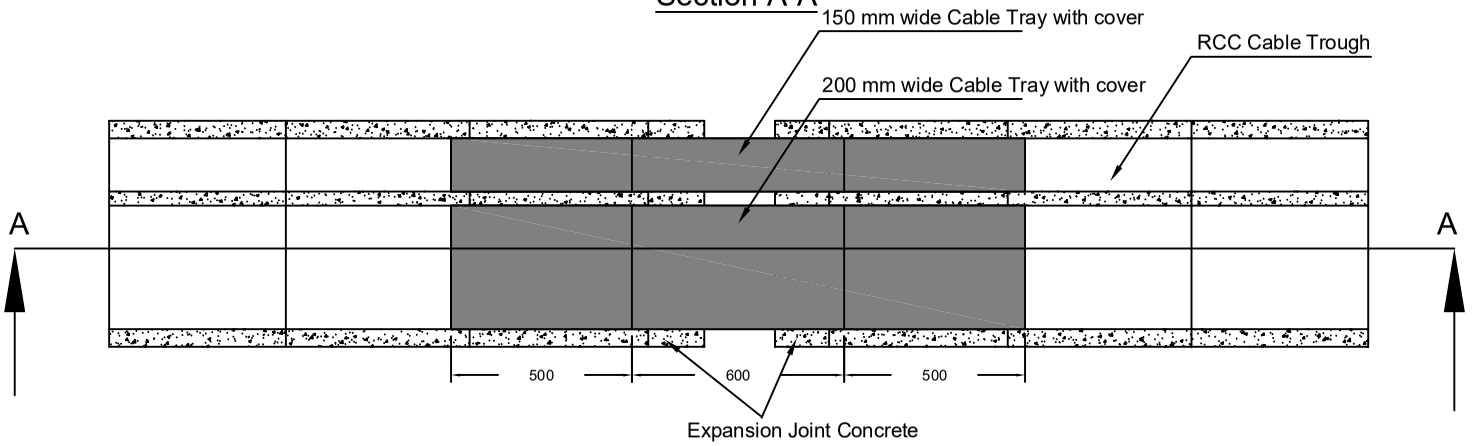
Original Drawing Size A1



PLAN with 350mm Tray



Section A-A



PLAN With 200mm Tray

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS IN METERS UNLESS OTHERWISE SPECIFIED.
2. ONLY WRITTEN DIMENSIONS SHALL BE FOLLOWED. DO NOT SCALE THE DRAWING.
3. For Detailed Specification refer Technical Specification and BoQ
4. Tray Covers to be tagged properly as directed by engineer with the Tag wires
5. Bottom Tray cover will be perforated and Top cover will be of plain.

KEY PLAN

CLIENT: BANGALORE METRO RAIL CORPORATION LTD

DRAWING TITLE: Cable Tray arrangement drawing for Reach-1 Extension of Phase-II

DRAWING NUMBER: BMRCL/ELE/348/2023/01

DRAWING STATUS	
As Built (B)	
Working Drawing (W)	✓
CRD (C)	
Definitive Design (D)	
Preliminary Design (P)	

CAD FILE:

SECTION 9: PROFORMA OF SECURITIES

PROFORMA – A: Form of Bank Guarantee/ e-BG for Earnest Money Deposit/ Tender Security

PROFORMA – B: Form of Bank Guarantee/ e-BG for Performance Security

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PROFORMA - A

FORM OF BANK GUARANTEE FOR EARNEST MONEY DEPOSIT (EMD)

(Reference ITT clause 14)

(To be stamped in accordance with Stamp Act, if any, applicable for the issuing bank)

To,
Bangalore Metro Rail Corporation Limited (BMRCL)
3rd Floor BMTC Complex,
K.H. Road, Shanthinagar
Bengaluru- 560027.
Karnataka, INDIA.

1. **WHEREAS** _____ *[Name and Address of the Tenderer]* (hereinafter referred to as the "Bidder" or "Tenderer") has undertaken for submission of Tender in pursuance of Tender Notification No. _____ for _____ *[Name of the Works]* (hereinafter referred to as the "Bid" or "Tender").

2. **AND WHEREAS** it has been stipulated in the Tender issued by Bangalore Metro Rail Corporation Limited (BMRCL) (hereinafter referred to as the "Employer" or "BMRCL") that the Tenderer shall furnish to Employer an unconditional and irrevocable Bank Guarantee from an Indian Scheduled Bank (excluding Cooperative Bank) or from a Scheduled Foreign Bank as defined in Section 2(e) of RBI Act 1934 read with second schedule, for the sum specified herein below as Tender Security(EMD) for compliance of the obligations in accordance with the Tender conditions. In pursuance to this, M/s_____ has requested for issuance of the Bank Guarantee for the sum specified herein below as Tender security (EMD).

3. **AND WHEREAS** we _____ *[Name and full address of the Bank including Email address]* having registered office at _____ (hereinafter referred to as the "Bank"), which expression shall unless repugnant to the context or the meaning thereof, include its successors, administrators, executors, assignees, do hereby agree to give the Employer such a Bank Guarantee drawn and payable at Bengaluru _____ branch on behalf of the tenderer.

4. **NOW therefore**, the Bank hereby affirm that it is the guarantor and responsible to 'Employer' and their successors, on behalf of the 'Tenderer' up to a total sum of INR _____ *[the amount of Guarantee to be specified in figure and words as specified in the Tender document]*. Further, the Bank hereby unconditionally, irrevocably and without demur undertake to immediately pay, the Employer upon the Employer's first written demand and without cavil, or arguments any sum or sums within the limits of the sum specified in this Bank Guarantee as aforesaid without the Employer being required to prove or to show grounds or reasons for the demand, by depositing/crediting to the Current Account of the Employer, the sums specified herein.

5. This Bank Guarantee is encashable at our designated Branch as mentioned below:

Name of the Bank, Branch and contact details Address Telephone no: & Fax No: E-mail Address Branch Manager/s name & mobile No: Bank Zonal Office Address, Telephone No, Fax Number, E-mail Address: _____

OR

This e- Bank Guarantee shall be encashable at the issuing branch of the Bank through NeSL portal.

6. The Bank hereby confirms that the Bank is on the SFMS (Structural Finance Messaging System) platform and shall invariably send an advice of the Bank Guarantee to the designated Bank of the Employer as given below:

Sl. No.	Particulars	Details
i	Name of Beneficiary	Bangalore Metro Rail Corporation Limited
ii	Name of Bank	Bank of India
iii	Branch	Cantonment Branch, Bengaluru.
iv	Address of Branch	49, Jyothi Mahal, St. Mark's Road, Bangalore - 560001
v	Account No.	840420110000760
vi	IFSC Code:	BKID0008404

7. This Bank Guarantee shall be encashed at the demand of the Employer on or before the due date.

8. The Employer shall have full rights to encash this bank guarantee at any time during the validity period and the 'Tenderer' shall have no right or claim whatsoever in the matter of encashment of the Bank guarantee amount by the 'Employer'. The Bank will be fully responsible in terms of the guarantee and obligation, to make immediate payment to 'Employer', without the consent of the Tenderer and without referring the matter to the 'Tenderer'.

9. The Bank will deliver the money required by the 'Employer' immediately on demand without delay without reference to the 'Tenderer' and without the necessity of a previous notice or of judicial or administrative procedures and without it being necessary to prove to the Bank the liability or damages resulting from any defects or shortcomings or debts of the 'Tenderer'.

10. Courts at Bengaluru, Karnataka, India shall have exclusive jurisdiction for adjudicating the disputes arising out of the encashment of the Guarantee, and, the said Bank undertakes not to revoke this Guarantee during its currency, except with the previous consent of the 'Employer' in writing and agree that any change in the constitution of the Bank shall not discharge its liability hereunder.

11. This Bank Guarantee will not be discharged due to the change in the constitution of the 'Tenderer' or change in the constitution of the bank.

12. This Deed of guarantee is signed and executed by Shri/Smt _____ and Shri/Smt _____ who is/are authorized by the Bank for issuing the guarantee on its behalf and their ID No/s. and Email address/es being_____ & _____ and _____ & _____ respectively.

13. The Bank's liability under this Guarantee shall not exceed the amount of _____ *[Indian Rupees to be specified in words and figures].*

14. This guarantee shall be valid till _____ *[Date to be mentioned]*.

15. The pendency of any dispute or arbitration or other proceedings shall not affect this guarantee in any manner.

16. It is hereby agreed that the liability of the Bank under this guarantee shall cease on whichever of the following events first occurs.
    a) Payment by the Bank of the guaranteed sum in full to the 'Employer',

    or

    b) Receipt of written communication from the 'Employer' to the Bank along with the original Bank Guarantee discharging the Bank of its liability covered by this Bank Guarantee. In case of electronic Bank Guarantee (e-BG), release/discharge of eBG by the Employer through NeSL Portal.

SIGNATURE AND SEAL OF THE GUARANTOR

DATE: _____

NAME OF THE BANK: _____

ADDRESS: _____

Note:

1. *The stamp paper of appropriate value shall be purchased in the name of the bank, who issues the 'Bank Guarantee".*
2. *The above format shall be used for e-Bank Guarantee also.*
3. *For e-BG, the Entity Number of BMRCL is 'AAACB4881D'.*
4. *Tender No. shall be the reference to be stated in the e-BG.*

PROFORMA – B

FORM OF BANK GUARANTEE FOR PERFORMANCE SECURITY"

(Reference GCC Clause 25)

(To be stamped in accordance with the Stamp Act of the Country of Issuing Bank)

To
Bangalore Metro Rail Corporation Limited (BMRCL)
3rd Floor, BMTC Complex,
K.H. Road, Shanthinagar
Bengaluru – 560027,
Karnataka, INDIA.

1. WHEREAS _____ [Name and Address of the Contractor] (hereinafter referred to as the "Contractor") has undertaken for due performance of the Contract, in pursuance of LoA/Contract No. _____ for _____ [Description of the Contract work to be specified] (hereinafter referred to as "the Contract"). The Contract was awarded by Bangalore Metro Rail Corporation Limited (hereinafter referred to as the "Employer" or "BMRCL"), which expression shall unless repugnant to the context or the meaning thereof, include its successors, administrators, executors and assignees, to the Contractor.
2. AND WHEREAS it has been stipulated in the Contract that the Contractor shall furnish to the Employer with an unconditional and irrevocable Bank Guarantee for Performance Security for the sum specified herein below as security for compliance of the obligations and performance of the Contractor. In pursuance to this M/s. _____ (the Contractor) has requested for issuance of the Bank Guarantee for the sum specified herein below.
3. AND WHEREAS we _____ [Name and full address of the Bank including Email address] having registered office at _____ (hereinafter referred to as the "Bank"), which expression shall unless repugnant to the context or the meaning thereof, include its successors, administrators, executors, assignees, and the correspondent Bank hereby agrees to give the Employer on behalf of the Contractor such a Bank Guarantee drawn and payable at Bengaluru branch.
4. NOW therefore, the Bank hereby affirm, that it is the guarantor and is responsible to the Employer and their successors, on behalf of the Contractor 'up to a total sum of _____ [the amount of Guarantee to be specified in figure and words in the respective currency/ies in which the contract price is payable]. Further, the Bank hereby unconditionally, irrevocably and without demur undertake to immediately pay, the Employer upon the Employer's first written demand and without cavil, or arguments any sum or sums within the limits of the sum specified in this Bank Guarantee as aforesaid without the Employer being required to prove or to show grounds or reasons for the demand, by depositing/crediting to the Current Account of the Employer, the sums specified herein.
5. This Bank Guarantee is encashable at the Issuing Bank's designated Branch in Bengaluru, Karnataka, India as mentioned below:

   Name of the Bank, Branch and contact details, Address, telephone no: & Fax No: E-mail Address Branch Manager/s name & Mobile No: Bank Zonal Office Address, Telephone No, Fax Number, E-mail Address: _____

OR

This e- Bank Guarantee shall be encashable at the issuing branch of the Bank through NeSL portal.

6. The Bank hereby confirms that the Bank is on the SFMS (Structural Finance Messaging System) platform and shall invariably send an advice of the Bank Guarantee to the designated Bank of the Employer (Bangalore Metro Rail Corporation Limited) as given below:

Sl. No.	Particulars	Details
i	Name of Beneficiary	Bangalore Metro Rail Corporation Limited
ii	Name of Bank	Bank of India
iii	Branch	Cantonment Branch, Bengaluru.
iv	Address of Branch	49, Jyothi Mahal, St. Mark's Road, Bangalore – 560 001
v	Account No.	840420110000760
vi	IFSC Code:	BKID0008404

7. This Bank Guarantee shall be encashed at the demand of the Employer on or before the due date.
8. The Employer shall have rights to encash this Bank Guarantee at any time during the validity period and the 'Contractor' shall have no right or claim whatsoever in the matter of encashment of the Bank Guarantee amount by the 'Employer'. The Bank will have their responsibility in terms of the guarantee and obligation, to make immediate payment to the 'Employer', without the consent of the 'Contractor' and without referring the matter to the 'Contractor'.
9. The Bank shall be liable to pay the 'Employer', any amount up to and inclusive of the aforementioned full amount upon written order from the 'Employer' to indemnify the 'Employer' for any liability or damage resulting from any defects and/or shortcomings of the 'Contractor' and/or the debts the 'Contractor' may have incurred with the 'Employer' and/or any parties involved in the Works under the Contract mentioned above, whether these defects and/or shortcomings and/or debts are actual and/or estimated and/or expected. The Bank will deliver the money required by the 'Employer' immediately on demand without delay without reference to the 'Contractor' and without the necessity of a previous notice or of judicial or administrative procedures and without it being necessary to prove to the Bank the liability or damages resulting from any defects or shortcomings or debts of the 'Contractor'.
10. Courts at Bengaluru, Karnataka, India shall have exclusive jurisdiction for adjudicating the disputes arising out of the encashment of the Guarantee, and, the said Bank undertakes not to revoke this Guarantee during its currency, except with the previous consent of the 'Employer' in writing and agree that any change in the constitution of the Bank shall not discharge its liability hereunder.
11. This Bank Guarantee will not be discharged due to the change in the constitution of the 'Contractor' or change in the constitution of the Bank.
12. This Deed of guarantee is signed and executed by Shri/Smt _____and Shri/Smt _____who is/are authorized by the Bank for issuing the guarantee on its behalf and their ID No/s. and Email address/es being _____ & _____ and _____ & _____ respectively.
13. The Bank's liability under this Guarantee shall not exceed the amount of_____ [Indian Rupees to be specified in words and figures].
14. This Bank guarantee shall be valid till _____ [Date to be mentioned].
15. The pendency of any dispute or arbitration or other proceedings shall not affect this guarantee in

any manner.

16. It is hereby agreed that the liability of the Bank under this guarantee shall cease on the happening of any of the following events:
    a) Payment by the Bank of the Guaranteed sum in full to the 'Employer',

    or

    b) Issue of written communication by the Employer, to the Bank, along with the original Bank Guarantee discharging the Bank of its liability covered by this Bank Guarantee. In case of electronic Bank Guarantee (e-BG), release/discharge of e-BG by the Employer through NeSL Portal.

SIGNATURE AND SEAL OF THE GUARANTOR

DATE: _____

NAME OF THE BANK: _____

ADDRESS: _____

Notes:

1. *The stamp paper of appropriate value shall be purchased in the name of the bank, who issues the 'Bank Guarantee".*
2. *The Bank Guarantee to be submitted shall be got issued from an Indian Scheduled Bank (excluding Cooperative Bank) or from a Scheduled Foreign Bank as defined in Section 2(e) of RBI Act 1934 read with second schedule.*
3. *The above format shall be used for e-Bank Guarantee also.*
4. *For e-BG, the Entity Number of BMRCL is 'AAACB4881D'.*
5. *Tender No. shall be the reference to be stated in the e-BG*

SECTION 10: ANNEXURES

ANNEXURE 1 - FORM OF CONTRACT AGREEMENT

ANNEXURE 2 - CHECKLIST

ANNEXURE 3 – DETAILS OF BANK ACCOUNT

ANNEXURE 4 - FORMAT OF DECLARATION TOWARDS DEBARMENT / BLACKLISTING

ANNEXURE 5 – UNDERTAKING

ANNEXURE 6 - FORM OF CERTIFICATE CONFIRMING SITE VISIT

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ANNEXURE- 1

FORM OF CONTRACT AGREEMENT

CONTRACT No. BMRCL/……

Manufacturing, Supply and Laying of Cable Trough for Reach-3 Extension and Reach-6 (New Line) of Phase-II

This **Contract Agreement** (hereinafter called the **"Contract"**) is made at Bangalore on the ..... day of …… by and between:

BANGALORE METRO RAIL CORPORATION LIMITED, a Public Limited Company incorporated under Companies Act 1956 and a 50:50 Joint venture of Government of India and Government of Karnataka formed for the purposes of execution of a Mass Rapid Transit System in the city of Bengaluru, represented herein by its Company Secretary, authorized to sign and bind the Company, with its registered and corporate office located at III Floor, BMTC Complex, K.H. Road, Shanthinagar, Bengaluru 560 027, Karnataka, India hereinafter referred to as the **"BMRCL"** or the **"EMPLOYER"**, as the case may be, which expression shall unless excluded by or repugnant to the context or meaning thereof be deemed to include its successors and assigns, of the one part,

and

M/s. …… (**Name of the Contractor)** ……. a …… (legal status) ……. Company incorporated under companies act 1956, having its office at ……. (Contractor's office address) ……. represented herein by Mr. …… (name and designation of the representative) ……. Authorized to sign and bind the Company under the Power of Attorney dated ……. And the Board Resolution dated …. Who shall be responsible to the Employer under the Contract no. ……. For **'Manufacturing, Supply and Laying of Cable Trough for Reach-3 Extension and Reach-6 (New Line) of Phase-II'** herein after referred to as the **"CONTRACTOR"** which expression shall unless excluded by or repugnant to the context or meaning thereof be deemed to include its successors and assigns, on the other part.

Herein after, BMRCL/Employer and Contractor are collectively referred to as 'Parties' and individually as 'party'.

WHEREAS, the Employer invited Tenders for Contract No "....." vide notification no. ……. dated …… and the Contractor has in response submitted a Tender for Maintenance Contract for **'Manufacturing, Supply and Laying of Cable Trough for Reach-3 Extension and Reach-6 (New Line) of Phase-II'** (hereinafter referred to in this Agreement as 'the Works') and agrees to undertake performance of the Works under the Terms and Conditions set forth in this Contract.

AND WHEREAS, the Contractor emerged as the successful Tenderer and the Employer awarded the Contract to the Contractor and the Contractor agrees for **'Manufacturing, Supply and Laying of Cable Trough for Reach-3 Extension and Reach-6 (New Line) of Phase-II'** under the Terms and conditions specified in this Contract Agreement and the other Contract Documents, forming part thereof.

NOW THEREFORE THE PARTIES HEREBY AGREE AS FOLLOWS:

Clause 1: Words and Expression

In this Contract, all the words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.

Clause 2: The Contract Documents

2.1 The following shall be deemed to form and be read and construed as a part of the Agreement

(a) Letter of Acceptance No. …… dated ……
(b) The Tender (Priced Bill of Quantities)
(c) Instruction to Tenderers/ Bidders
(d) General Conditions of Contract
(e) Special Conditions of Contract
(f) Bid Forms/ Tender Forms
(g) Technical Specifications including scope of work
(h) Drawings
(i) SHE Manual
(j) Employers clarifications to Pre-Bid queries and Addendum no…. dated….
(k) Contractors 'Qualification cum Technical 'and Financial proposals submitted vide letter no……dated…….
(l) All correspondence between the Tenderer/ Bidder and BMRCL from the date of issue of NIT and the date of issue of LOA.
(m) Performance Security in the form of Bank Guarantee issued by …. (name & address of the issuing bank) …. vide BG no……. dated……amounting to ……. valid up to…….and its authenticity Confirmed by the Issuing bank SFMS No….dtd….
(n) Any other document forming part of this Contract.

2.2 All of the foregoing documents, together with this Contract Agreement, are referred to herein as the Contract. Also incorporated into the Contract and made part hereof, are all codes, standard specifications, and similar requirements that are referred to therein.

Clause 3: Integration

The 'Employer' and the 'Contractor' agree that this Contract Agreement, together with other Contract Documents, expresses all of the agreements, understandings, promises and covenants of the parties, and integrates, combines and supersedes all prior and contemporaneous negotiations, understandings and agreements, whether written or oral and no modification or alteration of the Contract Documents shall be valid or binding on either party, unless expressed in writing and executed with the same formality as this Contract Agreement, except as may otherwise be specifically provided in the Contract Documents.

Clause 4: Contract Price and Completion Time: The Contract price is inclusive of all applicable Taxes & duties and Cess, but exclusive of CGST and SGST. BMRCL shall pay the output CGST and SGST as per applicable law (as per clause 39 of General Conditions of Contract and respective Special Conditions of Contract). Completion time for executing the works under the Contract is as below:

1.	Estimated cost specified in the Tender	Rs. ……
2.	Accepted percentage (Tender premium) (Above or Below or at par)	…… % put to Tender.
3.	**Total Contract Price**	**Rs……. (Indian Rupees…….. only).**
4.	Date of Commencement of Works	Date of issue of Notice To Proceed (NTP) as per clause 34 of ITT.
5.	Completion period	08 months as per Appendix to Form of Tender.

Clause 5: Obligations of the Contractor

The mutual rights and obligations of the Employer and the Contractor shall be as set forth in the Contract and in particular:

a) The Contractor agrees, subject to the terms and conditions of the Contract, to perform efficiently and faithfully all of the Works of "…… "*Name of the Work*" ……" under the contract including "…… "brief *scope of works*" ……", requisite for or incidental to the successful completion of the Works and in carrying out all duties and obligations imposed by the Contract.

b) The Contractor shall ensure full compliance with tax laws of India with regard to this contract and shall be solely responsible for the same. He shall submit copies of acknowledgements evidencing filing of returns and shall keep the employer fully indemnified against liability of tax, interest, penalty etc., of the contractor in respect thereof, which may arise.

Clause 6: Obligation of the Employer

The 'Employer' agrees, subject to the terms and conditions of the Contract, to pay the Contractor the amount specified and at the rates and terms and in the manner set forth in the Contract.

Clause 7: Governing Law

This Contract shall be construed/interpreted and enforceable under the applicable laws of the Republic of India

Clause 8: Language

This Contract Agreement and the other Contract Documents are made in the English language**.**

Clause 9: Notices

All Notices called by the Terms of the Contract shall be in writing in English Language and shall be delivered by hand or by registered mail with acknowledgement due. All notices shall be deemed to be duly made by the party to whom it is addressed at the following address or such other addresses as such party may subsequently notify the other.

To Employer:

Bangalore Metro Rail Corporation Ltd,
III Floor, BMTC Complex,
K.H. Road, Shanthinagar,
Bangalore-560027,
Karnataka, India.

To Contractor:

……
……
……
……
……

Clause 10: Jurisdiction of Court

The Courts at Bengaluru shall have exclusive jurisdiction in respect of all the disputes arising out of this Contract agreement between the Parties.

IN WITNESS WHEREOF, the parties hereto have caused this Contract to be signed in their respective names by the hands of their authorized representatives on the day and date first above written.

For

Bangalore Metro Rail Corporation Limited
(EMPLOYER)

(…….)
Executive Director (Traction)

WITNESS:

(……..)

For

(Contractor)

(……..)

WITNESS:

(……)

Note:

* *This Contract Agreement is tentative and may be modified as considered necessary at the time of finalization /signing of the Contract.*

** *Blanks to be filled by the BMRCL at the time of finalization of the Form of Agreement.*

*** *Any other condition considered to be essential in the interest of BMRCL shall be included.*

ANNEXURE - 2

CHECK LIST**

(A) The following check list is intended to help the Tenderers in submitting offer which are complete. An incomplete offer is liable to be rejected. Tenderers are advised to go through the Tender documents and the list carefully and take necessary action.

(B) Tenderers are also required to submit copy of the checklist, duly marked, along with their offer.

The Tender submittals shall consist of the following:

I	**QUALIFICATION CUM TECHNICAL PACKAGE**	
a.	Earnest Money Deposit / Tender Security (Clause 14 of ITT)*	Submitted / Not Submitted
b.	Form of Tender on firm's Letter head (Clause 10 of ITT)	Submitted / Not Submitted
c.	Notarized Power of Attorney (Clause 15.2)/ Attested copy of the Partnership deed / Ownership record to demonstrate the authority to sign the Tender submittals.	Submitted / Not Submitted
d.	Evidence of 'Tenderer's Eligibility and Qualification Criteria (Clause 2 & 3 of ITT) and **Qualification Information** (Section 3) with CA's certifications.	Submitted / Not Submitted
e.	Copy of PAN card	Submitted / Not Submitted
f.	Copy of GST Registration certificate	Submitted / Not Submitted
g.	**Bank Details** in prescribed Proforma given in **Annexure-3 in Section-10** along with a **cancelled Cheque leaf** (clause 14.2 of ITT)	Submitted / Not Submitted
h.	**Undertakings** as per prescribed Performa given in **Annexure-4** & **Annexure-5 in Section-10.**	Submitted / Not Submitted
i.	Constitution or legal status of Tenderer as per clause **1.1 of Section 3.**	Submitted / Not Submitted
j.	List of works executed and payments received year wise in the last five years as per clause **1.2 of Section 3 duly certified by CA.**	Submitted / Not Submitted
k.	Existing commitments and ongoing works as per clause **1.3 A of Section 3.**	Submitted / Not Submitted
l.	Works for which Tenders already submitted as per clause **1.3 B of Section 3.**	Submitted / Not Submitted
m.	Organization Chart (Section-3- 1.13)	Submitted / Not Submitted
n.	Certificate conforming Site visit as Performa given in Annexure-6	Submitted / Not Submitted
II	**FINANCIAL PACKAGE**	
a.	Priced Bill of Quantities in the format prescribed in Volume 2 (Clause 11 of ITT)	Submitted / Not Submitted

Note to the Tenderer:

** - To be submitted in **Original** only.*

*** - The above list is not exhaustive, any other document/s which are required as per the Tender document shall be submitted.*

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ANNEXURE - 3

DETAILS OF BANK ACCOUNT FOR REFUND OF EMD

- Name of the Firm/Tenderer:
- Name of the account to which amount to be remitted:
- Complete Address:
- Name of the Bank:
- Branch:
- Address of the Bank Branch:
- Account Type:
- Account Number:
- IFS Code of the Bank Branch:
- MICR Code of the Bank Branch:
- Whether a cancelled Cheque of the Tenderer/Firm is submitted: Yes or No (please tick)

Certified that the information furnished above is correct.

Signature of the Tenderer

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ANNEXURE - 4

FORMAT OF DECLARATION TOWARDS DEBARMENT / BLACKLISTING

We, M/s. ..... *[Name of the Tenderer]* ……, herein after called " the Contractor", do hereby affirm and declare that we have NOT been Black listed /Debarred by any Government / Government undertaking / semi Government / Govt. Controlled Institutions/projects/ Reputed private organizations in India during last five (5) years. We have NOT rescinded the works after award of the Contract during last five (5) years.

In case it is found that above statement is not true, any time during effect of this Tender or currency of the Contract entered between the parties based on the above statement, BMRCL reserves its rights to terminate the Contract and forfeit the Tender Security/ Performance Security at its discretion.

Place: Signature of the Tenderer

Date: Name

Designation

Seal of the Company

Phone

Note:

Last five (5) years shall be counted from 28 days prior to the date of submission of the Tender.

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ANNEXURE - 5

UNDERTAKING

We, M/s..... *[Name of the Tenderer]* ……., herein after called “the Contractor”, do hereby affirm and undertake to abide by all the terms, conditions and specifications given in the Tender document while performing the contractual obligations relating to …….*[name of work]*…….. of BMRCL, Bangalore. We do hereby affirm and undertake to follow all labour laws that are applicable from time to time.

We also undertake that the Tender submittals do not contain any deviation or amendment or modification or change of any type whatsoever with regard to tender conditions and specifications.

Place: Signature of the Tenderer

Date: Name

Designation

Seal of the Company

Phone

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ANNEXURE – 6

FORM OF CERTIFICATE CONFIRMING SITE VISIT

Name of work: **Manufacturing, Supply and Laying of Cable Trough for Reach-3 Extension and Reach-6 (New Line) of Phase-II**

This is to certify that in connection with this tender Manufacturing, Supply and fixing in position including finishing cement concrete (with 53 grade OP cement) precast cable troughs of M40 grade with twin and single cell using TMT reinforcement/mild steel bars with precast cement concrete cover slab for the stations, viaducts, crossover locations and jumper locations etc. for traction, signal and telecom cable arrangements for Reach-3 Extension and Reach -6 (New line) of Bangalore Metro Rail Project Phase-II. Representatives of M/s .....*[*] Name of the company]* …….. have visited the sites of work and have become conversant with the local conditions of working.

Signature of the Tenderer

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PART – I : SHE MANAGEMENT

1.0 General

1.1 Scope

1.1.1 This document defines the principal requirements of the Employer on Safety, Health and Environment (SHE) associated with the contractor / sub-contractor and any other agency to be practiced at construction worksites at all time.

1.2 Definition / languages

1.2.1 The Environmental Quality Management Manual (EQM) forms an essential part of the overall Environmental Protection System employed by BMRCL for the construction of Bangalore Metro project.

1.2.2 Definition & Abbreviations

a) **Environment-** The total surroundings of an organism including water, air and land and other living creatures.

b) **Environmental Pollutant** means any solid, liquid or gaseous substance present in such concentration as may be or tend to be injurious to environment.

c) **Environmental Pollution** means the presence in the environment of any environmental pollutant.

d) **Nuisance** is annoyance, which results from any construction activity that affects the material comfort and quality of life of the inhabitants of the area surrounding the construction site.

e) **Monitoring** is the use of direct or indirect reading field instrumentation to provide information regarding the levels of pollutants released during construction.

f) **Construction Site** is the contract limits for construction. It shall be all the area within the limits of the work as shown on the Plans. Construction site shall also include staging, and debris disposal areas and transportation routes to and from these areas.

g) **Noise** is any unwanted sound disturbance of the environment around the area of construction operations.

h) **Decibel** is a measure on a logarithmic scale of the magnitude of a particular quantity (such as sound pressure, sound power) with respect to a standardized reference quantity.

i) **A - weighted Noise levels** in Decibels (referenced to 20 micro-Pascal) as measured with A-weighting network of standard sound level meter, abbreviated dB (A).

j) **Energy Equivalent Level (L_{eq})** is the level of a steady noise which has the same energy as the fluctuating noise level integrated over the period of measurement. L_{max} is the maximum Noise Level during the period of measurement. L_{10} and L_{90} are the percentile exceeding levels of sound which is exceeded 10% and 90% of the time of measurement.

k) **Waste** is unwanted surplus substance arising from the application of all construction operations and any substance or article, which is required to be disposed.

l) **Suspended Particulate Matter** is abbreviated as SPM and measured in $\mu g/m^{3.}$

m) Environmental Quality Management Manual is abbreviated as **EQM.**

n) Air Monitoring and Control Plan is abbreviated as **AMCP**.

o) Noise Monitoring and Control Plan is abbreviated as **NMCP.** (*Noise Monitoring Deleted)*

q) Ministry of Environment and Forests, Government of India is abbreviated as **MOEF.**

r) Central Pollution Control Board, Bangalore is abbreviated as **CPCB.**

ENVIRONMENTAL MANAGEMENT PLAN OUTLINE

(Refer Environmental Protection Requirements, Appendix III)

1. CONTRACTOR'S OBLIGATION
1.1 Contractor details (including sub-contractors)
1.2 Organizational Chart (including sub-contractors).
1.3 Persons responsible for environmental matters, level of authority.
1.4 Environmental lines of communications.
2. PRESENTATION OF ENVIRONMENTAL MANAGEMENT APPROACH
2.1 General
2.1.1 Environmental Policy Statement of the Contractor
2.1.2 Methods of promoting environmental awareness.
2.1.3 Specific procedures for achieving the environmental performance requirements
2.2 Air
2.2.1 Mitigation Measures
2.2.2 Corrective Action
2.2.3 Preventive Action
2.2.3 Mitigation Schedule
2.2.4 Event Contingency Plan
Refer (Air Monitoring and Control Plan)
2.3 Water
2.3.1 Mitigation Measures
2.3.2 Corrective Action
2.3.3 Preventive Action
2.3.4 Mitigation Schedule
2.3.5 Event Contingency Plan
Refer (Spill Prevention and Control Plan)
2.4 Noise : *Noise Monitoring Deleted*
2.4.1 Mitigation Measures
2.4.2 Corrective Action
2.4.3 Preventive Action
2.4.4 Mitigation Schedule
2.4.5 Event Contingency Plan
Refer (Noise Monitoring and Control Plan) ***Noise Monitoring Deleted***
2.5 Waste
2.5.1 Procedures for disposal of waste
2.5.2 Corrective Action
2.5.3 Preventive Action
2.5.3 Mitigation Schedule
2.5.4 Hazardous Wastes and Chemicals
2.5.4.1 License Requirements
2.5.4.2 Storage
2.5.4.3 Handling Procedure

A similar approach will need to be adopted for the presentation of procedures and provisions to be followed to manage the construction process as it relates to:

- Landscape Preservation;
- Archaeological and Historical Resources; etc

2.6 Environmental Emergency Procedures

Emergency procedures for dealing with unforeseen environment situations not covered by the specific requirements and provisions of the Environmental Management Plan.

2.7 General House Keeping

3. ENVIRONMENTAL RECORDS

Including monitoring, inspection and reporting.

1.2.3 In this document

i) The use of '**shall**' indicates a mandatory requirement.

ii) The use of '**should**' indicates a guideline that is strongly recommended.

iii) The use of **'may'** indicates a guideline that is to be considered.

iv) '**SHE**' means Safety, Health and Environment.

v) **Employer** means Bangalore Metro Rail Corporation Ltd., (BMRCL)

vi) **Chief Safety Officer** means an officer nominated by BMRCL who is overall responsible for monitoring all SHE functions prescribed in this document.

vii) **BOCWA** means Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996

viii) **BOCWR** means Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Central Rules, 1998

ix) **DG** means Director General of Ministry of Labour, Govt. of India.

x) **BOCWWCA** means Building and Other Construction Workers' Welfare Cess Act, 1996

xi) **BOCWWCR** means Building and Other Construction workers welfare cess rules 1998

xii) **Building and other construction workers'** (Regulation of Employment and Condition of service) Karnataka rules, 2006.

xiii) **Notifications** (Central and state) – collection of cess.

1.3 Application of this document

1.3.1 This document applies to all aspects of the contractor's scope of work, including all aspects conducted by sub-contractors and all other agencies. There shall be no activity associated to the contract, which is exempted from the purview of this document.

1.4 Purpose of this document

1.4.1 The objective of these guidelines is to ensure that adequate precautions are taken to avoid accidents, occupational illness and harmful effects on the environment during construction.

1.4.2 This document:

i) Describes the SHE interfaces between Employer and the Contractor.

ii) Details the processes by which the contractor shall manage SHE issues while carrying out the work under the contract.

iii) Describes by reference, the practices and procedures as given in the BMRCL Project Safety, Health & Environment manual for best SHE performance.

1.4.3 **These requirements shall be read together with BMRCL Project SHE Manual, OHSAS 18001-1999 Occupational Health and Safety**

Management System and ISO 1400 1: 2004 Environmental Management Systems. Definition of key terms used in these requirements related to OHSAS 18001 and ISO 14001 standards are found in BMRCL's Project SHE Manual.

2.0 'SHE' Targets and Goals

2.1 The SHE targets, goals and aim for the Works are to achieve:

i) Zero total recordable injuries.
ii) Zero reportable environmental incidents
iii) All personnel inducted in accordance with the approved contractor SHE plan
iv) Total compliance of conducting inspections and audits as per approved SHE plan
v) 100% incident recording and reporting
vi) 100% adherence of usage of appropriate PPEs at work.
vii) Executing construction work with least disturbance to the environment, adjoining road users and traffic.

3.0 Compliance

3.1 Memorandum of Understanding (MOU)

3.1.1 A Memorandum of Understanding placed at ***Appendix No.: 1*** shall be executed before the award of contract by the contractor with regard to various provisions on Safety, Health and Environment to be practiced during the construction work.

3.2 BMRCL's SHE Policy and Management Systems

3.2.1 The construction works shall be undertaken in accordance with BMRCL's SHE Policy and Management Systems as amended from time to time provided in Project SHE Manual.

3.3 Indian statutory requirements

3.3.1 Primary statutory regulations

3.3.1.1 **Contractor shall develop thorough understanding about Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act 1996, Central Rules 1998, the building & other construction workers welfare cess act 1996 and central welfare rules 1998, Building and Other Construction Workers [RE&C] Karnataka Rules, 2006, Building and Other Construction Workers Welfare Cess act 1996 and Central Rules 1998, Notification [Central & State] – Collection of Cess, not only to satisfy the Inspectors' perspective but the use of legislation as the strong tool for effective SHE management at construction worksites. Contractor is strongly advised to practice the principle of voluntary compliance.**

3.3.1.2 In order to facilitate the contractor for better understanding on the various provisions of the above Act and Rules, a tabulated information highlighting the Sections/Rules referring to the corresponding registration of contractors, maintenance of registers and records, hours of work and wages, cess & welfare,

medical facilities and safety requirements are given in ***Appendix No.: 2***. It is an indicative one and not a limiting list.

3.3.2 In addition, the construction works shall be undertaken in accordance with all applicable legislation and Indian statutory requirements listed below but not limiting to:

i) Indian Electricity Act 2003 and Rules 1956
ii) National Building Code, 2005
iii) Factories Act, 1948, Karnataka Government Factories Rules.
iv) Motor Vehicles Act as amended in 1994 and The Central Motor Vehicles Rules, 1989.
v) Indian Road Congress Code IRC: SP: 55-2001 'Guidelines on Safety In Road Construction Zones.
vi) The Petroleum Act, 1934 and Rules 1976
vii) Gas Cylinder Rules, 2003
viii) Indian Explosives Act. 1884, along with the Explosives substance Act 1908 and the Explosives Rules 1983
ix) The (Indian) Boilers Act, 1923
x) The Public Liability Insurance Act 1991 and Rules 1991
xi) Minimum Wages Act, 1948 and Rules 1950
xii) Contract Labour Act, 1970 and Rules 1971
xiii) Child Labour (Prohibitions & Regulations) Act, 1986 and Rules 1950
xiv) Environment Protection Act, 1986 and Rules 1986
xv) Air (Prevention and control of Pollution) Act, 1981
xvi) Water (Prevention and Control of Pollution) Act, 1974
xvii) The Noise Pollution (Regulation & Control) Rules, 2000
xviii) Notification on Control of Noise from Diesel Generator (DG) sets, 2002
xix) Recycled Plastic Usage Rules, 1998
xx) Notification, Central Ground Water Board, Act January 1997
xxi) Manufacture, Storage & Import of Hazardous Chemicals Rules, 1989
xxii) The Hazardous Waste (Management & Handling) Rules, 1989
xxiii) Hazardous Waste Management Rules 1989 (as amended in 1999)
xxiv) Karnataka Preservation of Trees act, 1976 & rules, Batteries (Management and Handling) Rules
xxv) Fly ash utilization notification, Sept 1999 as amended in August 2003
xxvi) Guidelines of Karnataka Urban Arts Commission
xxvii) Mysore Tramway Act.

3.3.3 Workman Compensation Act, 1923 along with allied Rules

3.3.3.1 **The contractor shall ensure that all his employees / workmen are covered under 'Workmen Compensation Act' and shall pay compensation to his workmen as and when the eventuality for the same arises.**

3.3.4 Notwithstanding the above Act/Rules, there is nothing in those to exempt the contractor from the purview of any other Act or Rule in Republic of India for the safety of men and materials.

3.3.5 If the requirements stated in this document are less stringent than or in conflict with

the country's applicable legislation, the latter shall apply.

3.4 International Standards, Guidelines & ISO Certifications

3.4.1 The works should be undertaken in accordance with the applicable international guidelines, standards and specifications on SHE and every contract shall aim to achieve ISO certifications listed below during the currency of the contract:

OHSAS 18001-1999 : Occupational Health and Safety Management System.
ISO 14001-2004 : Environmental Management Systems.

3.4.2 The process of certification shall start immediately after the award of the work and complete within reasonable time. Towards this, the contractor shall undertake the required steps including appointment of ISO consultant for obtaining the certification on Occupational Health and Safety Management System and Environment Management System.

3.4.3 **In case of failure on the part of the contractor, the Employer at the cost of the contractor shall do the same.**

4.0 Contractor SHE Policy and Plan

4.1 The contractor as per Section 39 of the BOCW Act shall formulate a SHE policy and get it approved by DG respectively and display it at conspicuous places at work sites in Kannada, Hindi and other languages understood by the majority of construction workers.

4.2 Within 4 weeks of the notification of acceptance of the tender, the Contractor shall submit a detailed and comprehensive Contract specific SHE Plan. The SHE Plan shall include detailed policies, procedures and regulations which, when implemented, will ensure compliance of the contract provisions. The SHE Plan shall include the following but not be restricted to:

i) A statement of the Contractor's policy, organisation and arrangements for SHE
ii) The name(s) and experience of person(s) within the Contractor's proposed management who shall be responsible for co-ordinating and monitoring the Contractor's SHE performance;
iii) The number of SHE staff who shall be employed on the Works, their responsibilities, authority and line of communication with the proposed Contractor's agent;
iv) A statement of the Contractor's policy and procedures for identifying and estimating hazards, and the measures for addressing the same;
v) A list of SHE hazards anticipated for this Contract and sufficient information to demonstrate the Contractor's proposals for achieving effective and efficient health and safety procedures;
vi) A description of the SHE training courses and emergency drills which shall be provided by the Contractor, with an outline of the syllabus to be followed;
vii) Details of the safety equipment which shall be provided by the Contractor, including personal protective equipment;
viii) A statement of the Contractor's policy and procedures for ensuring that Contractor's Equipment used on the Project Site are maintained in a safe

condition and are operated in a safe manner;

ix) A statement of the Contractor's policy and procedures for ensuring that sub-contractors comply with the Contractor's safety plan;

x) A statement of the Contractor's disciplinary procedures with respect to SHE related matters, and

xi) A statement of the Contractor's procedure for reporting and investigating accidents, dangerous occurrences or occupational illnesses

4.3 The Contractor shall, from time to time and as necessary are required by the Employer to produce supplements to the SHE Plan such that it is at all times a detailed, comprehensive and contemporaneous statement by the Contractor of his site safety, industrial health and environment obligations, responsibilities, policies and procedures relating to work on Site. Any and all submissions of supplements to the SHE Plan shall be made to the Employer in accordance with the agreed procedures.

4.4 If at any time the SHE plan is, in the Employer's opinion, insufficient or requires revision or modification to ensure the security of the Works and the safety of all workmen upon and visitors to the Site, the Employer may instruct the Contractor to revise the SHE plan and the Contractor shall within 7 days submit the revised plan to the Employer for review.

4.5 Any omissions, inconsistencies and errors in the SHE Plan or the Employer's acceptance or rejection of the SHE Plan and/or supplements thereto shall be without prejudice to the Contractor's obligations with respect to site safety, industrial health and environment and shall not excuse any failure by the contractor to adopt proper and recognised safety practices throughout the execution of the Work.

4.6 The Contractor shall adhere to the SHE Plan and shall ensure, as far as practically possible, that all sub-contractors of all tiers require that contracting parties each have a copy of the Site SHE Plan and comply with its provisions.

4.7 The details of contents to be covered in the site SHE plan are given in ***Appendix No.: 3.***

5.0 Designer's role

5.0 Designer's role in Safety, Health and Environment

5.1 Designer's primary role includes to minimise the risk to health and safety of those who are going to construct, maintain, clean, repair, dismantle or demolish the structures and anyone else like adjoining road users/general public, who might be affected by the work.

5.2 General Philosophy

5.2.1 When considering health and safety in designer's work, they shall be expected to do what is reasonable at the time the design is prepared. It may be possible for hazards, which cannot be addressed at the feasibility stage to be looked at during detailed design. In deciding what is reasonably practicable, the risk to health and safety produced by a feature of the design has to be weighed against the cost of excluding the feature. The overall design process does not need to be dominated by a concern to avoid all risks during the construction phase and maintenance. However, a judgement has to be made by weighing up one consideration against

another so the cost is counted not just in financial terms, but also those of fitness for purpose, aesthetics, build ability or environmental impact. By applying these principles, it may be possible to make decisions at the design stage, which will avoid or reduce risks during construction work. In many cases, the large number of design considerations will allow a number of equally valid design solutions. What is important is the approach to the solutions of design problems. This should involve a proper exercise of judgement, which takes account of health and safety issues.

5.3 **Hierarchy of Risk Control**

5.3.1 Designers shall need, so far as reasonably practicable, to avoid or reduce risks by applying a series of steps known as the hierarchy of risk control or principles of prevention and protection. The steps to be adopted shall include the following:

i) Consider if the hazard can be prevented from arising so that the risk can be avoided (e.g., alter the design to avoid the risk);
ii) If this cannot be achieved, the risk should be combated at source (e.g., ensure the design details of items to be lifted include attachment points for lifting);
iii) Failing this, priority should be given to measures to control the risk that will protect all people;
iv) Only as a last resort should measures to control risk by means of personal protection be assumed (e.g., use of safety harnesses).

5.4 Duty to provide health and safety risks in the drawing itself

5.4.1 In case of situations were the designers have carried out the design work and concluded that there are risks, which are not reasonably practicable to avoid, detailed information shall be given about the health and safety risks, which remain. This information needs to be included with the design to alert others to the risks, which they cannot reasonably be expected to know. This is essential for the parties who have to use the design information.

5.4.2 If the designers basic design assumptions affect health or safety, or health and safety risks are not obvious from the standard design document, the designer shall provide additional information. The information shall include a broad indication of the assumptions about the precautions for dealing with the risks. The information will need to be conveyed in a clear manner; it shall be included on drawings, in written specifications or outline method statements. The level of detail to be recorded will be determined by the nature of the hazards involved and the associated level of risk.

5.5 **Employer's approval**

5.5.1 Every structure like scaffold, false work, launching girder, earth retaining structures etc. shall have its design calculations included in the method statements in addition to health and safety risks. Employers' designer or his approved proof check consultants as applicable as per the contract conditions shall approve all these designs.

5.6 Any non-standard structures like trestles made up of re-bars or structures which are very old, corroded, repaired for many times etc. for which no design calculations can be made accurately from any national standards, shall not be allowed to be used at sites even for short duration.

5.7 If any of the above-mentioned clauses are not adhered penalty shall be imposed depending upon the gravity of the unsafe act and or condition

6.0 Contractor SHE Organisation

6.1 Education and Experience

6.1.1 The contractor shall appoint the required SHE personnel as prescribed in General Instruction **BMRC/SHE/CEO/001** (enclosed at the end) based upon the statutory requirement and establish the safety organisation based upon the contract value. The minimum educational qualification and the work experience are given in General Instruction **BMRC/SHE/CEO/002**

6.1.2 **In order to effectively interact on labour welfare matters with the Employer and the statutory authorities enforcing the labour welfare legislations every contractor shall employ a full time Labour Welfare Officer duly qualified and experienced as per clause *6.1.1*.**

6.2 **Conduct and competency**

6. 2.1 The conduct and functioning of the contractor SHE personnel shall be monitored by the Employer. Any default or deficiency shall attract penalty as per details given under penalty clause ***56.0*** of this document.

6.2.2 The Contractor shall ensure that all personnel are competent to perform the job assigned to them. In the event that the Contractor is unable to demonstrate the competency of any person whose activities can directly impact on the Works' SHE performance, the Employer shall remove that person from the site without any procedural formalities.

6.3 **Approval from Employer**

6.3.1 The name, address, educational qualification, work experience and health condition of each personnel deployed for SHE jobs shall be submitted to the Employer in the format prescribed for the purpose for comments and approval well before the start of the work. Only on approval by the Employer these personnel are authorised to work. In case any of the SHE personnel leaves the contractor the same shall be intimated to the Employer. The contractor shall recruit new personnel and fill up the vacancy.

6.4 **Responsibility of SHE personnel**

6.4.1 **For all works carried out by the contractor and his sub-contractors, the responsibility of ensuring the required SHE manpower lies with the main contractor only. The minimum required manpower indicated by the Employer includes the sub-contractors' work also. It shall be the responsibility of the main contractor to provide required SHE manpower for all the works executed by all contractors. Necessary conditions shall be included in all sub-contract documents executed by the main contractor**.

6.5 Employment status of SHE personnel

6.5.1 No contractor shall engage SHE manpower from any outsourcing agencies in which case the effectiveness would be lost. All SHE manpower shall be on the payroll of the main contractor only and not on the payroll of any subcontractor or outsourcing manpower agencies etc. This condition does not apply to positions like traffic marshals who are engaged almost on a daily requirement basis.

6.6 **Reporting of SHE personnel**

6.6.1 All SHE personnel are to report to the Chief SHE Manager who shall report directly to the Chief Project Manager. The Employer shall monitor adherence to this procedure at all times. In case of non-adherence penalty shall be levied as indicated in the penalty clause.

6.7 **Inadequate SHE personnel**

6.7.1 **In case if the contractor fail to provide the minimum required manpower as illustrated in General Instruction BMRC/SHE/CEO/001 or fail to fill up vacancies created within 14 days, the same shall be provided by the Employer at contractor's cost. Any administrative expenses involved, providing the same like paper advertisement or manpower consultant charges, etc shall also be at the cost of contractor.**

6.8 **Prohibition of performance of other duties**

6.8.1 As per Schedule VIII of BOCWR no SHE personnel shall be required or permitted to do any work which is unconnected to, inconsistent with or detrimental to the performance of the SHE duties for respective category mentioned in General Information ***BMRC/SHE/CEO/001***

6.9 **Facilities to be provided to SHE personnel**

6.9.1 As per schedule VIII of BOCWR, the contractor shall provide all SHE personnel with such facilities, equipment and information that are necessary to enable him to dispatch his duties effectively.

6.9.2 The minimum Employer's requirements of such facilities / equipments to be provided for SHE personnel are given in the General Instruction ***BMRC/SHE/CEO/003***

7.0 Contractor SHE Committee

7.1 All employees should be able to participate in the making and monitoring of arrangements for safety, industrial health and environment at their place of work. The establishment of site SHE committees in which employees and Contractor and sub-contractor management are represented can increase the involvement and commitment of employees. The contractor shall ensure the formation and monitor the functioning of contractor SHE committees.

7.2 Terms of Reference

7.2.1 The Terms of Reference for the committee shall be as follows;

i) To establish company safety policies and practices

ii) To monitor the adequacy of the contractor's site SHE plan and ensure its implementation

iii) To review SHE training

iv) To review the contractor's monthly SHE report.

v) To identify probable causes of accident and unsafe practices in building or other construction work and to suggest remedial measures.

vi) To stimulate interest of Employer and building workers in safety by organizing safety week, safety competition, talks and film-shows on safety, preparing posters or taking similar other measures as and when required or as necessary.

vii) To go round the construction site with a view to check unsafe practices and detect unsafe conditions and to recommend remedial measures for their rectifications including first-aid medical and welfare facilities.

viii) Committee team members should perform a site inspection before every committee meetings and to monitor SHE inspection reports.

ix) To bring to the notice of the Employer the hazards associated with use, handling and maintenance of the equipment used during the course of building and other construction work

x) To suggest measures for improving welfare amenities in the construction site and other miscellaneous aspect of safety, health and welfare in building or other construction work.

xi) To look into the health hazards associated with handling different types of explosives, chemicals and other construction materials and to suggest remedial measures including personal protective equipment.

xii) To review the last safety committee meeting minutes and to take action against persons/sub-contractors for non-compliance if any.

7.3 Within 14 days of award of contract, the SHE committee shall be constituted and notification regarding the same shall be communicated to the members and employees as per the format provided in ***Form No.: SF 001***

7.4 Site SHE Committee meeting shall be conducted at least once in a **month** with the minimum members listed below:

Chairman	Project Manager
Secretary	SHE Manager (In-charge)
Members	i) Labour Welfare Officer ii) In charge of plant and machinery iii) In charge of site electrics iv) In charge of stores. v) Senior Managers/ Engineers heading different sub functions. vi) Sub – contractor's representative vii) Labour Contractor's representative viii) Workers' representative ix) Co-contractor representative. x) SHE staffs
Employer's Representatives	BMRCL SHE in charge and other representatives

7.5 Construction SHE Committee meeting shall be conducted at least once in a **week** with the minimum members listed below:

Chairman	Project Manager
Secretary	SHE Manager (In-charge)
Members	i) Labour Welfare Officer ii) In charge of plant and machinery iii) In-charge of site electricity iv) Senior Managers / Engineers heading different sub functions v) Sub- Contractor's representative vi) Labour contractor's representative vii) Workers' representatives viii) All SHE Staffs

7.6 **Co-contractors' participation**

7.6.1 In case of depot, station and other contiguous areas where more than one main contractors are working together, the Employer shall instruct the other contractors to join for the monthly SHE committee meeting of the main civil contractor, so as to discuss and decide about the common provision of security, lighting, toilet, drinking water etc. and sharing the maintenance cost of the same etc.

7.6.2 **The general principle for sharing the cost shall be either based on the contract value of works executed at the contiguous area or the daily average number of workmen employed by each contractor in the contiguous area.**

7.7 Minimum time between two monthly SHE Committee meetings

7.7.1 A minimum period of **21 days** shall be maintained between any two SHE monthly committee meetings.

7.8 **Agenda**

7.8.1 The Secretary shall circulate the agenda of the meeting at least seven working days in advance of the scheduled date of the meeting to all members.

7.8.2 **The agenda should broadly cover the following:**

i) Confirmation of minutes
ii) Chairman's review/overview of site SHE performance / condition
iii) Previous month SHE statistics
iv) Incident and Accident Investigation / dangerous occurrence / near miss report
v) Site SHE inspection
vi) Sub-contractors' SHE issues
vii) Safety presentation by Members
viii) Report from Employer
ix) Matters arising
x) Any other business

7.9 **Minutes of the meeting**

7.9.1 The Minutes of the meeting shall be prepared as per the format provided at ***Form No.: SF- 002*** and sent to all members within 2 working days preferably by mail/fax followed by hardcopy. Safety Committee meeting minutes shall also be displayed in the notice board for wider publicity to all concerned.

7.10 **Disciplinary Action**

7.10.1 The chairman shall inform the members of any outstanding issues in the meeting and in case of repeated offence/ non-compliance by some members or other co/sub contractors and propose suitable disciplinary action including provisions of monitory penalty as per the relevant contract clauses, the Employer shall ensure that the same is implemented.

8.0 ID Card and First day at work, SHE orientation training

8.1 The Contractor shall ensure that all personnel working at the site receive an induction SHE training explaining the nature of the work, the hazards that may be encountered during the site work and the particular hazards attached to their own function within the operation. The training shall cover the contents as given in the General Instruction ***BMRC/SHE/CEO/004*****.**

8.2 **All personnel shall be issued a photo identity card of size 85mm x 55mm duly signed by the authorized representative of the contractor before they are engaged for any work as per the format given in the General Instruction *BMRC/SHE/CEO/005***

8.3 Contractor shall also issue a personnel SHE handbook in a language known to the workers, which provides information on SHE and emergency procedures that all personnel working on contract are required to know and the need to follow. Contractor shall ensure that this is distributed and its content introduced to all personnel working at the site.

9.0 SHE Training

9.1 The behaviour of people at all levels of the contractor is critical for SHE performance.

9.2 The contractor shall organise quality SHE training to engage Managers, supervisors and other personnel in behavioural change and improve safety performance.

9.3 The Contractor shall analyse the training requirements for all the employees and initiate a training program to demonstrate that all persons employed, including subcontractors, are suitably qualified, competent and fit. This will include:

i) Detailed Job descriptions for all personnel, to include their specific SHE responsibilities

ii) Specification of qualifications, competency and training requirements for all personnel

iii) Assessment and recording of training needs for all personnel, including subcontractors' employees in the workforce, vendor representatives and site visitors

iv) A system for assessing new hirers e.g. previous training

v) A means of confirming that the system is effective

vi) A matrix and schedule of training requirements, covering general, task–specific and SHE-related training, showing the training frequency and interval between refresher courses

vii) Timely, competent delivery of training courses

9.4 The contractor shall arrange behavioural-based training programmes for all the executives to identify, recognise and eliminate unsafe act and unsafe conditions.

9.5 The minimum Employer's requirement of training needs for various categories of employees are given in general instruction ***BMRC/SHE/CEO/006***

9.6 The contents of SHE training to Managers/Supervisors as given in general instruction ***BMRC/SHE/CEO/007*** shall be conducted.

9.7 **The refresher-training programme to all employees shall be conducted once in six months.**

9.8 **Toolbox talk as given in the Employer's Project SHE manual shall be conducted to all high-risk workmen every day.**

9.9 **On-the spot practical skill development training on height safety including scaffold safety, crane safety, welding safety, electrical safety, traffic safety for marshals shall also be conducted to all foremen/ workmen who were associated to the concerned jobs.**

9.10 **Every employee including workman shall take safety Oath daily without fail.**

9.11 **All vehicle drivers including heavy vehicle operators shall be trained on defensive driving at Central Training Institute KSRTC, Shanthinagar Bangalore, or any other driving institute registered under Motor Vehicles Act.**

9.12 All the above listed training programmes except at clause ***9.11*** shall be organised by the contractor only after taking approval from the Employer for the training faculty / organisation, content and durations.

9.13 **In case of failure on the part of the contractor to provide all the above-mentioned training programs to all employees in time, the same shall be provided by the Employer through accredited agencies if required by formulating a common scheme to all contractors. Any administrative expenses and training fee towards the same shall be at the cost of the contractor.**

10.0 SHE Inspection

10.1 The contractor shall evolve and administer a system of conducting SHE inspections and other risk management analysis on a periodical basis.

10.2 The purpose of SHE inspection is to identify any variation in construction activities and operations, machineries, plant and equipment and processes against the SHE Plan and its supplementary procedures and programs.

10.3 Following SHE inspections program shall be adopted.

i) Planned General Inspection
ii) Routine Inspection
iii) Specific Inspection
iv) Other Inspection

10.3.1 Planned General Inspection

10.3.1.1 Planned general inspections are performed at predetermined intervals and it usually involves the representation from both Contractor and the Employer.

10.3.1.2 Inspections that will be classified under this inspection program are:

i) Monthly contractor and sub-contractors site safety committee Inspection.
ii) Weekly safety inspection by construction supervisors (Contractors and Sub-contractors).
iii) Daily safety inspection by contractor site SHE team.

10.3.2 Routine Inspection

10.3.2.1 Routine inspections are often referring to the inspection of work site, equipment and temporary structures performed by site and equipment operators and temporary structure erectors.

Inspections that will be classified under this inspection program are:

i) Daily Inspection of plant and equipment by operator
ii) Weekly Inspection of scaffold by scaffolding supervisor
iii) Monthly Inspection of electrical hand tools by competent electrical supervisor
iv) Quarterly Inspection of temporary electrical systems by competent electrical supervisor
v) Half-yearly inspection of lifting machinery, lifting appliances, equipment and gears by Govt. approved competent person.

10.3.2.2 The list mentioned above is not exhaustive. Contractor may add additional categories. Contractors' Site SHE Manager will ensure that a system of routine inspections is carried out periodically to all plants, equipment, powered tools and any other temporary structures that will pose a hazard to operators and workmen.

10.3.3 Specific Inspection

10.3.3.1 Specific inspection are performed on activities without a predetermined date. Competent supervisors usually perform inspections for ensuring an activity whether it is executed in accordance to a general set of rules; method statement submitted or developed procedures.

The following are examples that will be commonly performed as required on the construction site:

i) Inspection performed before a heavy lifting operation.

ii) Inspection performed before and after the entry of person into a confined space.

iii) Inspection performed before and after a welding and gas cutting operation.

iv) Inspection of formwork before concreting by formwork erector.

The list mentioned above is not exhaustive. The contractor shall ensure that a competent supervisor inspects all high-risk processes and activities.

10.3.4 Other Inspection

Other inspections include the following:

i) Mandatory Inspections by Labour Department of Government.

ii) BMRCL site SHE management team

10.3.5 The contractor shall prepare all required safety inspection checklist for all activity operations and equipment. Checklists will be prepared based on the Indian standards, rules and regulations and Employer's requirements. The formats provided in the Project SHE manual may be referred.

10.3.6 All inspection records and reports will be properly kept and filed for audit purpose. Inspection reports of Planned General Inspection and Routine Inspection will be used for discussion during Safety Committee Meetings.

11.0 SHE Audit

11.1 General

11.1.1 The purpose and scope of SHE audit is to assess potential risk, liabilities and the degree of compliance of construction Safety, Health & Environmental plan and its supplementary procedures and programs against applicable and current SHE legalisation regulations and requirements of the employer.

11.1.2 Project Manager holds the ultimate responsibility in ensuring implementation of SHE audit program during the construction work.

11.2 Monthly Audit Rating Score (M A R S)

11.2.1 **Monthly Audit Rating Score (MARS) will be performed once in a month. A team consisting of Project manager and Employer representative based on the pre-designed score-rating format will conduct it. The details of the pre-designed monthly audit score rating formats are given in the Project SHE manual.**

11.2.2 This Monthly SHE Audit Rating Score (MARS) report will enable the Employer to evaluate the general compliance by the Contractor with the Conditions of Contract, the Employer's Project SHE Manual and the Contractor's site specific SHE Plan.

11.2.3 Monthly Audits will be conducted in accordance with BMRCL Guidelines. The Project Manager accompanied by the Employer's representatives shall carry out

the Audit. The Contractor's senior manager and SHE in-charge should also be invited to attend.

11.2.4 **Timing**

The Monthly Audit Rating Score (MARS) should be conducted at least 7 days prior to the scheduled date of Monthly SHE Committee meeting.

11.2.5 **Evaluation**

11.2.5.1 The numerical scoring has been weighed on a 1-10 scale. The audit team will use their observations noted in evaluating the points to be awarded against each of the elements of the audited section. Wherever some topics and sub-topics are not applicable the score rating need not be given. The overall audit ratings shall be achieved by:

$$\text{Overall Audit rating} = \frac{\text{Actual Score Achieved}}{\text{Maximum Possible Score}} \times 100$$

11.2.5.2 The criticality of the required actions for the respective sections of the Audit will be classified as:

Sl. No.	Score	Description	Action
1	< 60%	Immediate	Require Contractor to rectify within 24 hours
2	< 75%	Improvement Necessary	Contractor rectification within 7 days and confirmed in writing to Employer
3	< 90%	Improvement Desirable	Contractor rectification within one month and confirmed in writing to Employer

11.2.6 **Report**

A copy of each Audit Report will be sent to Employer and to all subcontractors, with whom it will then be discussed in detail at the Monthly SHE Committee Meeting in order to ensure that any corrective actions are agreed upon.

11.3 **Monthly Electrical Safety Audit**

11.3.1 A team comprising of contractor's senior SHE (Electrical) engineer and Employer's representative shall conduct monthly electrical safety audit covering the following and submit the report to Employer.

i) Electrical accidents investigation findings and remedy
ii) Adequacy of power generation and power requirements
iii) Power distribution and transmission system in place
iv) Updated electrical single line diagram showing the current condition of power source and distribution including the IP44 DBs arrangement.
v) Electrical protection devices – selection, installation and maintenance.
vi) Earth or ground connection and earth pit maintenance details

vii) Education and training of electrical personnel undertaken
viii) Routine electrical inspection details
ix) Electrical maintenance system and register.
x) Name plate details of major electrical equipment
xi) Classified zones in the site, if any.

11.4 **External SHE Audit**

11.4.1 **External SHE audits are to be conducted by external agencies that are competent with ISO qualified auditors with the prior approval of the Employer.**

11.4.2 **Areas of competence of Audit team**

11.4.2.1 **Practical understanding of BOCW Act and Rules, statutory requirements on health/medical and welfare of workmen, construction hazards and its prevention and control, traffic management, electrical safety, rigging, safety of construction equipment and environment management**.

11.4.2.2 **Audit shall be conducted as per the guidelines of ISO, ILO, and national standards. Audit report shall also be presented as per the above formats**.

11.4.3 **External SHE audits shall be conducted on a quarterly basis throughout the currency of the contract.**

11.4.4 Targets of SHE Audit:

The contents and coverage of the external audit shall include the following items

11.4.4.1 SHE management:

i) Organization
ii) Communication and Motivation
iii) Time office
iv) Inspection
v) Emergency preparedness
vi) Budget allocation
vii) Education and Training
viii) Work permit system

11.4.4.2 Technical:

i) Building and Structure
ii) Construction operational safety
iii) Material safety
iv) Hand tools and Power tools
v) Electrical system
vi) Safety Appliances

vii) Fire prevention and control
viii) Housekeeping
ix) Maintenance and Machinery safety
x) First-aid and Medical Facilities
xi) Welfare measures
xii) Environmental Management

11.4.5 **Audit Documents:**

11.4.5.1 **Contractor shall make the below listed documents available for the review by the Audit team.**

i) SHE policy
ii) SHE manual
iii) SHE Rules and Regulation
iv) SHE organization chart
v) Annual SHE objectives / programs
vi) Accident / near miss statistics and analysis
vii) SHE Training program / records for all personnel
viii) Operating manuals and maintenance manual of all equipments
ix) Safe worthiness certificates of all lifting appliances and gears
x) Medical fitness record for all personnel
xi) Risk identification, assessment and control details
xii) Environmental management reports
xiii) Emergency management records including mock drill

11.4.6 Audit Preparation:

i) Audit team members are required to gather information by observations through interviews and by checks of hardware and documentation.
ii) Audit team shall prepare checklist to cover all parts based on SHE legislations rules and regulations and BMRCL requirements.
iii) Audit team members shall verify the facts and findings leading to the identified gaps and weakness.
iv) Audit leader has overall responsibility for reaching a conclusion.

11.4.7 Reporting:

11.4.7.1 Audit report shall be prepared and directly sent to the Employer within 7 days of conducting the audit with a copy to the contractor.

11.4.8 Report contents:

i) Executing summary - based on the finalized checklists as written the findings to the Employer by the audit team members, the audit leader will compile a concise and accurate summary of observations and findings.
ii) Introduction - this will contain basic information regarding the facilities or organization audited, the specific audit dates (inclusion of those for preparation and post-audit activities).

iii) Principal positive findings - This will contain the summary of positive aspects as observed by the auditors. It will also contain highlights of those issue, which may warrant dissemination as best practice regarding methodology used or achievement.

iv) Audit Findings - All audit findings as detailed in the audit checklists shall be grouped together as priority 1 and 2 as detailed below in a separate listing.

a) Priority 1: Actions to rectify gaps or weakness should generally be implemented within 2 – weeks, if risk potential is high or unacceptable.

b) Priority 2: Actions should be generally implemented or rectified with a maximum of 3 – 4 weeks, if not rectified would create a likelihood of minor injury or business loss.

11.4.9 Conformity Report & Action by Employer

11.4.9.1 The auditor shall inspect the site after 14 days of conducting initial audit for checking the adequacy of implementation of items maintained under priority 1 by the contractor and shall submit a conformity / non-conformity report to the Employer with a copy to the contractor.

11.4.9.2 The auditor shall again inspect after 28 days of conducting initial audit for checking the adequacy of implementation of items mentioned under priority 2 by the contractor and shall submit a conformity / non-conformity report to the Employer with a copy to the contractor.

11.4.9.3 In case of non-conformity of items mentioned by auditor, the Employer shall take necessary steps including stoppage of work and or imposing any penalty for getting the item implemented.

11.4.10 Failure of contractor to conduct External SHE Audit

11.4.10.1 **If the contractor fails to conduct the external SHE audit in time, the Employer at the cost of contractor shall get it done.**

12.0 SHE Communication

12.1 The contractor shall take every effort to communicate the Safety, Occupational health and Environment management measures through posters campaigns / billboards / banners / glow signs being displayed around the work site as part of the effort to rise safety awareness amongst to the work force. Posters should be in Hindi, English and other suitable language deemed appropriate. Posters / billboards / banners/ glow signs should be changed at least once in a month to maintain the impact.

12.2 The contractor shall also observe important days as listed in General Instruction ***BMRC/SHE/CEO/008***and printing and displaying safety signage and posters as listed in General Instruction ***BMRC/SHE/CEO/009***

12.3 The list indicated are the minimum requirements of the Employer and the contractor is encouraged to further the SHE communication activities by formulating suitable reward schemes for safety performers and any other activities, which deem fit for the purpose.

13.0 SHE Submittals to the Employer

13.1 The contractor's SHE management should send the following reports to the Employer periodically:

i) Daily Reporting of total no of workmen (as given in Clause ***13.2***)
ii) Monthly SHE Report (as given in Clause ***13.3***)
iii) SHE Committee Meeting Minutes (as given in Clause ***7.9.1***)
iv) SHE Inspection Reports
v) SHE Audit Reports
   a) Monthly Audit Rating Score (MARS) report
   b) External SHE Audit
   c) Electrical Safety Audit
vi) Air and Noise Quality monitoring report *(Noise Monitoring Deleted*).

13.2 **Daily Reporting of total no of workmen**

13.2.1 **The contractor shall report to the Employer the total no of workmen engaged by all including any subcontractor within 2 hours of starting of any shift in any day. This reporting shall be the primary duty of the Chief SHE Manager of the contractor and reporting shall be through tele-fax / email. The onus of checking the receipt of the same by the Employer lies with the contractor. If the information is not received or received more than 2 hrs after starting of the shift, penalty shall be levied as per relevant clause.**

13.3 Monthly SHE Report

13.3.1 The contractor shall prepare a monthly SHE report consisting of the following and submit 3 copies within 7th of next month to the Employer as specified in the Project SHE manual.

i) Monthly man-hour details as specified in the Project SHE manual
ii) Monthly accident / incident details as specified in the Project SHE manual
iii) SHE committee details
iv) Details of SHE training conducted in the month
v) SHE Inspection
vi) SHE internal audit details like electrical audit etc.
vii) SHE Communication activities under taken in the month indicating the number of posters displayed and balance availability in stock.
viii) Air quality / Noise monitoring details *(Noise Monitoring Deleted*
ix) Toolbox talks details
x) PPE details: Quantity purchased, issued to the workmen and stock available.
xi) Details on IP 44 panel boards, lighting poles, welding and cutting equipments, Ladders, Hoists, tools & tackles.
xii) Monthly Lux meter study results
xiii) Housekeeping
xiv) Barricade maintenance details
xv) No of critical excavations
xvi) Health & Welfare activities

xvii) Safety walk conducted by Contractors' Project Manager in the month

xviii) SHE Activities Planned for next month

14.0 Accident reporting and investigation

14.1 Reporting to Employer

14.1.1 **All accidents and dangerous occurrences shall immediately be informed verbally to the Employer. This will enable the Employer to reach to the scene of accident / dangerous occurrences to monitor/assist any rescue work and/or start conducting the investigation process so that the evidences are not lost.**

14.1.2 **Reports of all accidents (fatal / injury) and dangerous occurrences shall also be sent within 24 hours as per format provided in the Employer's Project SHE manual.**

14.1.3 **No accident / dangerous occurrences is exempted from reporting to the Employer.**

14.1.4 **Any wilful delay in verbal and written reporting to the Employer shall be penalised as per relevant clause.**

14.2 Reporting to Govt. organisations

14.2.1 In addition to the above verbal and written reporting to the Employer, as per Rule 210 of BOCWR, notice of any accident to a worker at the building or construction site that:

a) Causes loss of life; or

b) Disables a worker from working for a period of 48 hours or more immediately following the accident;

c) Shall forthwith be sent by telegram, telephone, fax, or similar other means including special messenger within four hours in case of fatal accidents and 72 hours in case of other accidents, to:

   i) The Regional Labour Commissioner, wherein the contractor has registered the firm/work

   ii) The board with which the worker involved was registered as a beneficiary;

   iii) Director General and

   iv) The next of kin or other relative of the worker involved in the accident;

14.2.2 Further, notice of accident shall be sent in respect of an accident which

a) Causes loss of life; or

b) Disables the injured worker from work for more than 10 days to

   i) The officer-in-charge of the nearest police station;

   ii) The District Magistrate or, if the District Magistrate by order so desires, to

   iii) The Sub-Divisional Magistrate

14.2.3 In case of an accident causing minor injury, first-aid shall be administered and the injured worker shall be immediately transferred to a hospital or other place for medical treatment.

14.2.4 Where any accident causing disablement that subsequently results in death, notice in writing of such death, shall be sent to the authorities mentioned in clause ***14.2.1*** and ***14.2.2*** above within 72 hours of such death.

14.2.5 Reporting of dangerous occurrences:

14.2.5.1 The following classes of dangerous occurrences shall be reported to the Inspector having jurisdiction, whether or not any disablement or death caused to the worker, namely:

a) Collapse or failure of lifting appliances, or hoist, or conveyors, or similar equipment for handling of building or construction material or breakage or failure of rope, chain or loose gears; or overturning of cranes used in construction work;
b) Falling of objects from height;
c) Collapse or subsidence of soil, tunnel, pipe lines, any wall, floor, gallery, roof or any other part of any structure, launching girder, platform, staging, scaffolding or means of access including formwork;
d) Explosion of receiver or vessel used for storage of pressure greater than atmospheric pressure, of any gas or gases or any liquid or solid used as building material;
e) Fire and explosion causing damage to any place on construction site where building workers are employed;
f) Spillage or leakage of any hazardous substance and damage to their container;
g) Collapse, capsizing, toppling or collision of transport equipment;
h) Leakage or release of harmful toxic gases at the construction site;

14.2.6 In case of failure of launching girder, lifting appliance, loose gear, hoist or building and other construction work, machinery and transport equipment at a construction site, such appliances, gear, hoist, machinery or equipment and the site of such occurrence shall, as far as practicable, be kept undisturbed until inspected by the Authorities;

14.2.7 Every notice given for fatal accidents or dangerous occurrences shall be followed by a written report to the concerned Authorities under Section 39 of BOCWA and the Director General in the specified Form XIV of BOCWR.

14.3 Accident investigation

14.3.1 General

14.3.1.1 Investigations should be conducted in an open and positive atmosphere that encourages the witnesses to talk freely. The primary objective is to ascertain the facts with a view to prevent future and possibly more serious occurrences

14.3.1.2 Accidents and Dangerous Occurrences which result in death, serious injury or serious damage must be investigated by the Contractor immediately to find out the cause of the accident/occurrence so that measures can be formulated to prevent any recurrence.

14.3.1.3 Near misses and minor accidents should also be investigated by the Contractor as soon as possible as they are signals that there are inadequacies in the safety management system.

14.3.2 **Procedure of incident investigation**

14.3.2.1 It is important after any accident or dangerous occurrence that information relating to the incident is gathered in an organised way. The following steps shall be followed;

a) Take photographs and make sketches
b) Examine involved equipment, workplace or material and the environmental conditions
c) Interview the injured, eye-witnesses and other involved parties
d) Consult expert opinion where necessary
e) Identify the specific contractor or sub-contractor involved.

14.3.2.2 Having gathered information, it is then necessary to make an analysis of incident

a) Establish the chain of events leading to the accident or incident
b) Find out at what stage the accident took place
c) Consider all possible causes and the interaction of different factors that led up to the accident, and identify the most probable cause The cause of an accident should never be classified as carelessness. The specific act or omission that caused the accident must be identified.

14.3.2.3 The next stage is to proceed with the follow-up action

a) report on the findings and conclusions
b) formulate preventive measures to avoid recurrence
c) publicise the findings and the remedial actions taken

14.4 **Employers' independent incident investigation**

14.4.1 In case of fatal / dangerous occurrence the Employer shall also conduct independent investigation. Contractor and his staff shall extend necessary co-operation and testify about the accident.

14.4.2 The contractor shall take every effort to preserve the scene of accident till the Employer completes the investigation.

14.4.3 All persons summoned by the Employer in connection to witness recording shall obey the instructions without delay. Any wilful suppression of information by any person shall be removed from the site immediately and / or punishable as per relevant penalty clause.

15.0 Emergency Preparedness Plan

15.1 The Contractor shall prepare as required under Rule 36 of BOCWR, an Emergency Response Plan for all work sites as a part of the Contractor SHE Plan. The plan shall integrate the emergency response plans of the Contractor and all other subcontractors. The Emergency Response Plan shall detail the Contractor's procedures, including detailed communications arrangements, for dealing with all emergencies that could affect the Site. This include where applicable, injury, sickness, evacuation, fire, chemical spillage, severe weather and rescue.

15.2 The contractor shall ensure that an Emergency Response Plan is prepared to deal with emergencies arising out of:

i) Fire and explosion
ii) Collapse of lifting appliances and transport equipment
iii) Collapse of building, sheds or structure etc.
iv) Gas leakage or spillage of dangerous goods or chemicals
v) Bomb threatening, Criminal or Terrorist attack
vi) Drowning of workers
vii) Landslides getting workers buried floods, Earthquake, storms and other natural calamities.

15.3 Arrangements shall be made for emergency medical treatment and evacuation of the victim in the event of an accident or dangerous incident occurring, the chain of command and the responsible persons of the contractor with their telephone numbers and addresses for quick communication shall be adequately publicized and conspicuously displayed in the workplace.

15.4 Contractors shall require to tie-up with the hospitals and fire stations located in the neighbourhood for attending to the casualties promptly and emergency vehicle kept on standby duty during the working hours for the purpose.

15.5 Contractor shall conduct an onsite emergency mock drill once in every month for all his workers and his subcontractor's workers.

15.6 It shall be the responsibility of the contractor to keep the Local Law & Order Authorities informed and seek urgent help, as the case may be, so as to mitigate the consequences of an emergency. Prompt communication to BMRCL, telephonically initially and followed by a written report, shall be made by the contractor.

16.0 Experts / Agencies for SHE services

16.1 Contractors may utilise the services of experts/agencies empanelled under Rule 250 of BOCWR for the purpose of training, internal audit and any other SHE services with prior approval of the Employer.

16.2 As an aide to contractors, a list of experts/agencies and the offered service are given in General Instruction ***BMRC/SHE/CEO/010*** for ready reference. In addition to it if the contractor would like to use any expert/agencies' services for any SHE activities the same can also be allowed provided that they are competent and meet to the general requirements of Employer. In every case prior approval of the Employer is mandatory.

PART – II : SAFETY

17.0 Housekeeping

17.1 Housekeeping is the act of keeping the working environment cleared of all unnecessary waste, thereby providing a first-line of defence against accidents and injuries.

17.2 Contractor shall understand and accept that improper housekeeping is the primary hazard in any construction site and ensure that a high degree of housekeeping is always maintained. Indeed “Cleanliness is indeed next to Godliness”

17.3 Housekeeping is the responsibility of all site personnel, and line management commitment shall be demonstrated by the continued efforts of supervising staff towards this activity.

17.4 General Housekeeping shall be carried out by the contractor and ensured at all times at Work Site, Construction Depot, Batching Plant, Labour Camp, Stores, Offices and toilets/urinals. Towards this the Contractor shall constitute a special group of housekeeping personnel as per General Instruction ***BMRC/SHE/CEO/001***. This group shall ensure daily cleaning at work sites and surrounding areas and maintain a register as per the approved format by the Employer.

17.5 Adequate time shall be assigned to ensure that good housekeeping is maintained. Team of housekeeping squad shall carry out this.

17.6 The contractor shall be responsible to provide segregated containers for disposal of debris at required places and regular cleaning of the same.

17.7 Full height fence, barriers, barricades etc. shall be erected around the site in order to prevent the surrounding area from excavated soil, rubbish etc, which may cause inconvenience to and endanger the public. The barricade especially those exposed to public shall be aesthetically maintained by regular cleaning and painting as directed by the Employer. These shall be maintained in one line and level.

17.8 The structure dimension of the barricade, material and composition, its colour scheme, BMRC logo and other details shall be in accordance with specifications laid down in tender document.

17.9 All stairways, passageways and gangways shall be maintained without any blockages or obstructions. All emergency exits passageways, exits fire doors, break-glass alarm points, firefighting equipment, first aid stations, and other emergency stations shall be kept clean, unobstructed and in good working order.

17.10 Lumber with protruding nails shall be bent or removed and properly stacked.

17.11 All surplus earth and debris are removed/disposed of from the working areas to officially designated dumpsites. Trucks carrying sand, earth and any pulverized materials etc. in order to avoid dust or odour impact shall be covered while moving. **The tyres of the trucks leaving the site shall be cleaned with water, wherever the possibility of spillage on carriageways meant for regular road traffic exists.**

17.12 No parking of trucks/trolleys, cranes and trailers etc. shall be allowed on roads, which may obstruct the traffic movement.

17.13 Roads shall be kept clear and materials like: pipes, steel, sand boulders, concrete, chips and brick etc. shall not be allowed on the roads to obstruct free movement of road traffic.

17.14 Water logging or bentonite spillage on roads shall not be allowed. If bentonite spillage is observed on road endangering the safety of road users, the contractor shall be penalised as per relevant clause.

17.15 Proper and safe stacking of material are of paramount importance at yards, stores and such locations where material would be unloaded for future use. The storage area shall be well laid out with easy access and material stored / stacked in an orderly and safe manner.

17.16 Flammable chemicals / compressed gas cylinders shall be safely stored.

17.17 Unused/surplus cables, steel items and steel scrap lying scattered at different places within the working areas shall be removed to identified locations(s).

17.18 All wooden scrap, empty wooden cable drums and other combustible packing materials, shall be removed from work place to identified location(s).

17.19 Empty cement bags and other packaging material shall be properly stacked and removed.

17.20 The Contractor shall ensure that all his sub-contractors maintain the site reasonably clean through provisions related to house keeping

18.0 Working at Height

18.1 Definitions

18.1.1 "**Access"** and "**egress**" include ascent and descent.

18.1.2 "**Fragile surface**" means a surface, which would be able to fail if any reasonably foreseeable loading were to be applied to it.

18.1.3 **"Line"** includes rope, chain or webbing

18.1.4 **"Personal fall protection**" means -

a) A fall prevention, work restraint, work positioning, fall arrest or rescue system, other than a system in which the only safeguards are collective safeguards; or
b) Rope access and positioning techniques;

18.1.5 **"Work at height"** means –

a) Work in any place, including a place at or below ground level;

b) Obtaining access to or egress from such place while at work, except by a staircase in a permanent workplace, where, if protective measures were not taken, a person could fall a distance liable to cause personal injury;

18.1.6 **"Work equipment"** means any machinery, appliance, apparatus, tool or installation for use at work (whether exclusively or not) and includes

a) A guard-rail, toe-board, barrier or similar collective means of protection
b) A working platform
c) A net, airbag or other collective safe guard for arresting falls.
d) Personal fall protection system
e) Ladders

18.1.7 "**Working platform**"

a) Means any platform used as a place of work or as a means of access to or egress from a place of work;
b) Includes any scaffold, suspended scaffold, cradle, mobile platforms, trestle, gangway, gantry and stairway which is so used.

18.2 Organisation and planning

The contractor shall ensure that work at height is

i) properly planned for any emergencies and rescue
ii) appropriately supervised; and
iii) carried out in a manner, which is reasonably practicable safe.

18.3 The contractor shall ensure that work at height is carried out only when the weather conditions do not jeopardise the health or safety of persons involved in the work.

18.4 Competence

The contractor shall ensure that no person engages in any activity, including organization, planning and supervision, in relation to work at height or work equipment for use in such work unless he is competent to do so or, if being trained, is being supervised by a competent person.

18.5 Avoidance of risks from work at height

The contractor shall ensure that work is not carried out at height where it is reasonably practicable to carry out the work safely otherwise than at height.

18.6 Where work is carried out at height, the contractor shall take suitable and sufficient measures as given below to prevent, so far as is reasonably practicable, any person **falling a distance liable to cause personal injury**.

a) His ensuring that the work is carried out
   i) From an existing place of work; or
   ii) (In the case of obtaining access or egress) using an existing means, complying to the requirements as given in ***18.15***

   Where it is reasonably practicable to carry it out safely and under appropriate ergonomic conditions; and

b) Where it is not reasonably practicable for the work to be carried out in accordance with sub-paragraph (a), his providing sufficient work equipment for preventing, so far as is reasonably practicable, a fall occurring.

18.7 Where the measures taken under clause ***18.6*** do not eliminate the risk of a fall occurring, every contractor shall

a) So far as is reasonably practicable, provide sufficient work equipment to minimise -

i) The distance and consequences; or

ii) Where it is not reasonably practicable to minimise the distance, the consequences, of a fall; and

b) Without prejudice to the generality of clause ***18.4***, provide such additional training and instruction or take other additional suitable and sufficient measures to prevent, so far as is reasonably practicable, any person falling a distance liable to cause personal injury.

18.8 Selection of 'work equipment' for work at height

1) The contractor, in selecting work equipment for use in work at height, shall

a) Give collective protection measures priority over personal protection measures; and

b) Take account of

i) The working conditions and the risks to the safety of persons at the place where the work equipment is to be used;

ii) In the case of work equipment for access and egress, the distance to be negotiated;

iii) The distance and consequences of a potential fall;

iv) The duration and frequency of use;

v) The need for easy and timely evacuation and rescue in an emergency; and

vi) Any additional risk posed by the use, installation or removal of that work equipment or by evacuation and rescue from it;

2) The contractor shall select work equipment for work at height which:

a) Has characteristics including dimensions which:

i) Are appropriate to the nature of the work to be performed and the foreseeable loadings; and

ii) Allow passage without risk; and

b) Is in other respects the most suitable work equipment, having regard in particular to the purposes specified in ***18.5*** and ***18.6.***

18.9 Fragile surfaces

18.9.1 The contractor shall ensure that no person at work passes across or near, or working on, from or near, a fragile surface where it is reasonably practicable to carry out work safely and under appropriate ergonomic conditions without his doing so.

18.9.2 Where it is not reasonably practicable to carry out work safely and under appropriate ergonomic conditions without passing across or near, or working on, from or near, a fragile surface, every contractor shall,

a) Ensure, so far as is reasonably practicable, that suitable and sufficient platforms, coverings, guard rails or similar means of support or protection are provided and used so that any foreseeable loading is supported by such supports or borne by such protection;

b) Where a risk of a person at work falling remains despite the measures taken under the preceding provisions of this regulation, take suitable and sufficient measures to minimise the distances and consequences of his fall.

18.9.3 Where any person at work may pass across or near, or work on, from or near, a fragile surface, every contractor shall ensure that ,

a) Prominent warning notices are so far as is reasonably practicable affixed at the approach to the place where the fragile surface is situated; or

b) Where that is not reasonably practicable, such persons are made aware of it by other means.

18.10 Falling objects

18.10.1 The contractor shall, where necessary to prevent injury to any person, take suitable and sufficient steps to prevent, so far as is reasonably practicable, the fall of any material or object.

18.10.2 where it is not reasonably practicable to comply with the requirements of ***18.9***, every contractor shall take suitable and sufficient steps to prevent any person being struck by any falling material or object which is liable to cause personal injury.

18.10.3 the contractor shall ensure that no material or object is thrown or tipped from height in circumstances where it is liable to cause injury to any person.

18.10.4 Every employer shall ensure that materials and objects are stored in such a way as to prevent risk to any person arising from the collapse, overturning or unintended movement of such materials or objects.

18.11 **Danger areas**

18.11.1 Without prejudice to the preceding requirements of these Regulations, every contractor shall ensure that,

a) Where a workplace contains an area in which, owing to the nature of the work, there is a risk of any person at work;

i) Falling a distance; or

ii) Being struck by a falling object,

which is liable to cause personal injury, the workplace is so far as is reasonably practicable equipped with devices preventing unauthorised persons from entering such area; and

b) Such area is clearly indicated.

18.12 Inspection of work equipment

18.12.1 The contractor shall ensure that, where the safety of work equipment depends on how it is installed or assembled, it is not used after installation or assembly in any position unless it has been inspected in that position.

18.12.2 The contractor shall ensure that work equipment exposed to conditions causing deterioration which is liable to result in dangerous situations is inspected

a) At suitable intervals; and

b) Each time that exceptional circumstances which are liable to jeopardise the safety of the work equipment have occurred,

to ensure that health and safety conditions are maintained and that any deterioration can be detected and remedied in good time.

18.12.3 Without prejudice to paragraph ***18.12.1***, the contractor shall ensure that a working platform

a) Used for construction work; and

b) From which a person could fall 2 metres or more,

is not used in any position unless it has been inspected in that position or, in the case of a mobile working platform, inspected on the site, within the previous 7 days.

18.12.4 The contractor shall ensure that the reports of all inspections are properly maintained and shown to the Employer as and when required.

18.12.5 In this clause "inspection",

a) Means such visual or more rigorous inspection by a competent person as is appropriate for safety purposes;

b) Includes any testing appropriate for those purposes,

18.13 Inspection of places of work at height

18.13.1 The contractor shall so far as is reasonably practicable ensure that the surface and every parapet, permanent rail or other such fall protection measure of every place of work at height are checked on each occasion before the place is used.

18.14 Duties of persons at work

18.14.1 Any workmen employed by the contractor shall report to the supervisor about any defect relating to work at height which he knows is likely to endanger the safety of himself or another person.

18.14.2 Every workmen shall use any work equipment or safety device provided to him for work at height by the contractor, in accordance with

a) Any training in the use of the work equipment or device concerned which have been received by him; and

b) The instructions respecting that use which have been provided to him by the contractor as per the requirements of the Employer

18.15 Requirements for existing places of work and means of access or egress at height

Every existing place of work or means of access or egress at height shall

a) Be stable and of sufficient strength and rigidity for the purpose for which it is intended to be or is being used;

b) Where applicable, rest on a stable, sufficiently strong surface;

c) e of sufficient dimensions to permit the safe passage of persons and the safe use of any plant or materials required to be used and to provide a safe working area having regard to the work to be carried out there;

d) Possess suitable and sufficient means for preventing a fall;

e) Possess a surface which has no gap

i) Through which a person could fall;

ii) Through which any material or object could fall and injure a person; or

iii) Giving rise to other risk of injury to any person, unless measures have been taken to protect persons against such risk;

f) Be so constructed and used, and maintained in such condition, as to prevent, so far as is reasonably practicable -

i) The risk of slipping or tripping; or

ii) Any person being caught between it and any adjacent structure;

g) Where it has moving parts, be prevented by appropriate devices from moving inadvertently during work at height.

18.16 Requirements for guardrails, toe-boards, barriers and similar collective means of protection

i) Unless the context otherwise requires, any reference in this section to means of protection is to a guardrail, toe-board, barrier or similar collective means of protection.

ii) Means of protection shall

a) Be of sufficient dimensions, of sufficient strength and rigidity for the purposes for which they are being used, and otherwise suitable;

b) Be so placed, secured and used as to ensure, so far as is reasonably practicable, that they do not become accidentally displaced; and

c) Be so placed as to prevent, so far as is practicable, the fall of any person, or of any material or object, from any place of work.

iii) In relation to work at height involved in construction work

a) The top guard-rail or other similar means of protection shall be at least 950 millimetres above the edge from which any person is liable to fall;

b) Toe-boards shall be suitable and sufficient to prevent the fall of any person, or any material or object, from any place of work; and

c) Any intermediate guardrail or similar means of protection shall be positioned so that any gap between it and other means of protection does not exceed 470 millimetres.

iv) Any structure or part of a structure which supports means of protection or to which means of protection are attached shall be of sufficient strength and suitable for the purpose of such support or attachment.

18.17 Requirements for all Working Platforms

i) Every working platforms requires a supporting structure for holding it

ii) Any surface upon which any supporting structure rests shall be stable, of sufficient strength and of suitable composition safely to support the supporting structure, the working platform and any loading intended to be placed on the working platform.

iii). Stability of supporting structure

Any supporting structure shall

a) Be suitable and of sufficient strength and rigidity for the purpose for which it is being used;
b) In the case of a wheeled structure, be prevented by appropriate devices from moving inadvertently during work at height;
c) In other cases, be prevented from slipping by secure attachment to the bearing surface or to another structure, provision of an effective anti-slip device or by other means of equivalent effectiveness;
d) Be stable while being erected, used and dismantled; and
e) When altered or modified, be so altered or modified as to ensure that it remains stable.
f) Have suitable base plates and properly footed thereby.

iv). Stability of working platforms

A working platform shall

a) Be suitable and of sufficient strength and rigidity for the purpose or purposes for which it is intended to be used or is being used;
b) Be so erected and used as to ensure that its components do not become accidentally displaced so as to endanger any person;
c) When altered or modified, be so altered or modified as to ensure that it remains stable; and
d) Be dismantled in such a way as to prevent accidental displacement.

v) Safety on working platforms

A working platform shall

a) Be of sufficient dimensions to permit the safe passage of persons and the safe use of any plant or materials required to be used and to provide a safe working area having regard to the work being carried out there;
b) Possess a suitable surface and, in particular, be so constructed that the surface of the working platform has no gap
    i) Through which a person could fall;
    ii) Through which any material or object could fall and injure a person; or
    iii) Giving rise to other risk of injury to any person, unless measures have been taken to protect persons against such risk; and
c) Be so erected and used, and maintained in such condition, as to prevent, so far as is reasonably practicable
    i) The risk of slipping or tripping; or
    ii) Any person being caught between the working platform and any adjacent structure.

vi) Loading

A working platform and any supporting structure shall not be loaded so as to give rise to a risk of collapse or to any deformation, which could affect its safe use.

vii) Additional requirements for scaffolding

Strength and stability calculations for scaffolding shall be carried out unless

a) A note of the calculations, covering the structural arrangements contemplated, is available; or

b) It is assembled in conformity with a generally recognised standard configuration.

viii) Depending on the complexity of the scaffolding selected, a competent person shall draw up an assembly, use and dismantling plan. This may be in the form of a standard plan, supplemented by items relating to specific details of the scaffolding in question.

ix) A copy of the plan, including any instructions it may contain, shall be kept available for the use of persons concerned in the assembly, use, dismantling or alteration of scaffolding until it has been dismantled.

x) The dimensions form and layout of scaffolding decks shall be appropriate to the nature of the work to be performed and suitable for the loads to be carried and permit work and passage in safety.

xi) While a scaffold is not available for use, including during its assembly, dismantling or alteration, it shall be marked with general warning signs in accordance with and be suitably delineated by physical means preventing access to the danger zone.

xii) Scaffolding may be assembled, dismantled or significantly altered only under the supervision of a competent person and by persons who have received appropriate and specific training in the operations envisaged which addresses specific risks which the operations may entail and precautions to be taken, and more particularly in

a) understanding of the plan for the assembly, dismantling or alteration of the scaffolding concerned;
b) safety during the assembly, dismantling or alteration of the scaffolding concerned;
c) measures to prevent the risk of persons, materials or objects falling;
d) safety measures in the event of changing weather conditions which could adversely affect the safety of the scaffolding concerned;
e) permissible loadings;
f) any other risks which the assembly, dismantling or alteration of the scaffolding may entail.

18.18 Requirements for collective safeguards for arresting falls

i) Collective safeguard are a safety net, airbag or other collective safeguard for arresting falls

ii) A safeguard shall be used only if

a) A risk assessment has demonstrated that the work activity can so far as is reasonably practicable be performed safely while using it and without affecting its effectiveness;
b) The use of other, safer work equipment is not reasonably practicable; and
c) A sufficient number of available persons have received adequate training specific to the safeguard, including rescue procedures.

iii) A safeguard shall be suitable and of sufficient strength to arrest safely the fall of any person who is liable to fall.

iv) A safeguard shall
   a) In the case of a safeguard which is designed to be attached, be securely attached to all the required anchors, and the anchors and the means of attachment thereto shall be suitable and of sufficient strength and stability for the purpose of safely supporting the foreseeable loading in arresting any fall and during any subsequent rescue;
   b) In the case of an airbag, landing mat or similar safeguard, be stable; and
   c) In the case of a safeguard, which distorts in arresting a fall, afford sufficient clearance.

v) Suitable and sufficient steps shall be taken to ensure, so far as practicable, that in the event of a fall by any person the safeguard does not itself cause injury to that person.

18.19 **Requirements for personal fall protection systems**

i) A personal fall protection system shall be used only if
   a) A risk assessment has demonstrated that
      i) The work can so far as is reasonably practicable be performed safely while using that system; and
      ii) The use of other safer work equipment is not reasonably practicable; and
   b) The user and a sufficient number of available persons have received adequate training specific to the operations envisaged, including rescue procedures.

ii) A personal fall protection system shall
   a) Be suitable and of sufficient strength for the purposes for which it is being used having regard to the work being carried out and any foreseeable loading;
   b) Where necessary, fit the user;
   c) Be correctly fitted;
   d) Be designed to minimise injury to the user and, where necessary, be adjusted to prevent the user falling or slipping from it, should a fall occur; and
   e) Be so designed, installed and used as to prevent unplanned or uncontrolled movement of the user.

iii) A personal fall protection system designed for use with an anchor shall be securely attached to at least one anchor, and each anchor and the means of attachment thereto shall be suitable and of sufficient strength and stability for the purpose of supporting any foreseeable loading.

iv) Suitable and sufficient steps shall be taken to prevent any person falling or slipping from a personal fall protection system.

18.20 **Requirements for Ladders**

1) Every contractor shall ensure that a ladder is used for work at height only if a risk assessment has demonstrated that the use of more suitable work equipment is not justified because of the low risk and
   i) The short duration of use; or
   ii) Existing features on site, which he cannot alter.
2) Only metal ladders shall be allowed. Bamboo ladders are prohibited.
3) Any surface upon which a ladder rests shall be stable, firm, of sufficient strength and of suitable composition safely to support the ladder so that its rungs or steps remain horizontal, and any loading intended to be placed on it.
4) A ladder shall be so positioned as to ensure its stability during use
5) A suspended ladder shall be attached in a secure manner and so that, with the exception of a flexible ladder, it cannot be displaced and swinging is prevented.
6) A portable ladder shall be prevented from slipping during use by -
   i) Securing the stiles at or near their upper or lower ends;
   ii) An effective anti-slip or other effective stability device; or
   iii) Any other arrangement of equivalent effectiveness.
7) A ladder used for access shall be long enough to protrude sufficiently above the place of landing to which it provides access, unless other measures have been taken to ensure a firm handhold.
8) No interlocking or extension ladder shall be used unless its sections are prevented from moving relative to each other while in use.
9) A mobile ladder shall be prevented from moving before it is stepped on.
10) Where a ladder or run of ladders raises a vertical distance of 9 metres or more above its base, there shall, where reasonably practicable, be provided at suitable intervals sufficient safe landing areas or rest platforms.
11) Every ladder shall be used in such a way that
    a) A secure handhold and secure support are always available to the user; and
    b) The user can maintain a safe handhold when carrying a load unless, in the case of a step ladder, the maintenance of a handhold is not practicable when a load is carried, and a risk assessment has demonstrated that the use of a stepladder is justified because of
       i) The low risk; and
       ii) The short duration of use.

19.0 Overhead protection

All contractors shall provide overhead protections as per Rule 41 of BOCWR

i) Overhead protection should be erected along the periphery of every building which is under construction and the building height shall be 15m or above after construction.
ii) Overhead protection shall be minimum 2m wide and the outer edge shall be 150mm higher than the inner edge and an angle not more than 20^0 to its horizontal sloping into the building.
iii) Overhead protection shall not be erected more than a height of 5m from the base of the building.

iv) Areas of inadvertent hazard of falling of material shall be guarded or barricaded or roped-off thereby by the contractor.

20.0 Slipping, Tripping, Cutting, Drowning and Falling Hazards

As per Rule 42 of BOCWR,

i) All places should be free from dust, debris or similar materials.

ii) Sharp projections or any protruding nails or similar objects shall be suitably guarded or shall even be avoided to make the place safe to work.

iii) Contractor shall not allow workmen to work or use platforms, scaffolds/passageways or any walkways, which has water, or oil or similar substances spilt and has a slipping hazard, unless it is cleaned off or covered or sanded or saw dusted or make it safe with any suitable material.

iv) When workers are exposed to areas where fall into water is possible, the contractor shall provide suitable and adequate equipment for saving the workers from drowning and rescuing from such hazard. If the Employer considers, the contractor shall provide well-equipped boat or launch, manned with trained personnel at the work place.

v) Open side or opening where worker, equipment, vehicle or lifting appliance may fall at a building or outside shall be guarded suitably except in places of free access by reasons of nature of work.

vi) Suitable safety net shall be provided at places of material / man falling is possible in accordance with national standards.

21.0 Lifting Appliances and Gear

21.1 Lifting appliances means a crane, hoist machinery, derrick, winch, gin pole, sheer legs, jack, hoist drum, slewing machinery, slewing bearing fasteners, loffing machinery sheaves, pulley blocks, hooks or other equipment used for lifting materials, objects or building workers and lifting gears means ropes, chain slings, shackles, hooks, lifting lugs, wire ropes, lifting eyebolts and eyenuts and other accessories of a lifting appliance.

21.2 No machine shall be selected to do any lifting on a specific job until its size and characteristics are considered against:

i) The weights, dimensions and lift radii of the heaviest and largest loads

ii) The maximum lift height, the maximum lift radius and the weight of the loads that must be handled at each

iii) The number and frequency of lifts to be made

iv) How long the crane will be required on site

v) The type of lifting to be done (for example, is precision placement of loads important?)

vi) The type of carrier required (this depends on ground conditions and machine capacity In its operating quadrants) capacity is normally greatest over the rear, less over the side, and non-existent over the front

vii) Whether loads will have to be walked or carried

viii) Whether loads will have to be suspended for lengthy periods

ix) The site conditions, including the ground where the machine will be set up, access roads and ramps it must travel, space for erection and any obstacles that might impede access or operation

21.3 The contractor shall ensure that a valid certificate of fitness issued as per clause ***21.5*** is available for all lifting appliances including synchronised mobile jacks, pre-stressing hydraulic jacks, jacks fitted with launching girders etc. and Employers approval before inducting to the site. **Only after obtaining the approval from the Employer any lifting appliances and gear shall be used.**

21.4 **The laminated photocopies of fitness certificate issued by competent person, the Employers' approval letter, the operators' photo, manufacturer's load chart and competency certificate shall always be either kept in the operator cabin or pasted on the visible surface of the lifting appliances.**

21.5 **All lifting appliances and loose gears shall be clearly marked for its safe working load and identification by stamping or other suitable means.**

21.6 The contractor shall also maintain a register containing a system of identification of all tools and tackles, its date of purchase, safe working load, competent person date of examination etc.

21.7 Test and periodical examination of lifting appliances and gears

21.7.1 All lifting appliances including all parts and gears thereof, whether fixed or movable shall be thoroughly tested and examined by a competent person once at least in every six months or after it has undergone any alterations or repairs liable to affect its strength or stability. Within the validity, if the lifting appliances are shifted to a new site, re-examination by the same competent person for ensuring its safety shall also be done.

21.7.2 Contractors can utilise the services of any competent person as defined in Factories Act, 1948 and approved by Chief Inspector of Factories with the permission of the Employer.

21.7.3 All alarms and signals like automatic safe load indicators (SLI), boom angle indicators, boom extension indicators, over lift boom alarm, swing alarm, hydraulic safety valves, mechanical radius indicators, load moment indicators etc. shall be periodically examined and maintained always in working condition

21.8 **Automatic safe load indicators**

21.8.1 **As stipulated in Rule 78 of BOCWKR 2006, no lifting appliances gear or any other material handling appliance is used, if:**

i) The Inspector having jurisdiction is not satisfied with reference to a certification of test or examination or to an authenticated record maintain as provided under these rules; and

ii) In the view of such Inspector, the lifting appliance, lifting gear or any other material handling appliance is not safe for use in building or other construction work; and

iii) No pulley block is used in building or other construction work unless the safe working load and its identification are clearly marked on such block.

21.9 Qualification of operator of lifting appliances and of signaller etc

21.9.1 The contractor shall not employ any person to drive or operate a lifting machine like crane, hydra etc whether driven by mechanical power or otherwise or to give signals to work as a operator of a rigger or derricks unless he

i) Is above twenty-one years of age and possesses a valid heavy transport vehicle driving licence as per Motor Vehicle Act and Rules.
ii) Is absolutely competent and reliable
iii) Possesses the knowledge of the inherent risks involved in the operation of lifting appliances by undergoing a formal training at any institution of national importance acceptable to Employer
iv) Is medically examined periodically as specified in schedule VII of BOCW Rules.

21.10 General requirements of appliances

21.10.1 Out-of level

21.10.1.1 One of the most severe effects of being out-of fit level is that side loads develop in the boom. Because of side loads all mobile cranes lose capacity rapidly as the degree of out-of-level increases and therefore

21.10.2 Boom

i) The boom is one of the more critical elements of the crane and must be in perfect condition at all time. No boom section with a bent lattice member shall be allowed
ii) All welds shall be crack and corrosion free
iii) No member of the boom shall be bent
iv) All telescopic boom shall be free from cracks, rust, flaking or cracked paint, bulges, greases or varnishes

21.10.3 The sweep area (work area) of the construction machinery shall be always free from obstructions.

21.10.4 All hydraulic piping and fittings shall be maintained leak proof.

21.10.5 The operator cab shall posses good and safe:

i) Structure, windows and windshield wipers
ii) Drivers chair and foot rest
iii) Control handles
iv) Cab instrumentation
v) Telecommunication
vi) Cab out fitting
vii) Wind indicator with an adjustable set point shall be in a position representative for the wind on the crane. The indicator shall give continuous information regarding constant speeds and gusts.

21.11 **Mandatory rigging requirements**

21.11.1 **Rigging shall be done under experienced and qualified rigger only.**

21.11.2 **The primary requirement in rigging shall be to assess the weight of load before attempting any lift.**

21.11.3 **All hooks shall be fitted with Master Rings having certificate of fitness from the competent person, so that the hooks are subjected to balanced vertical loading only.**

21.11.4 **Only four legged slings shall be allowed which includes master link (ring), intermediate master link (ring) if necessary, chain / wire rope sling, sling hook or other terminal fitting.**

21.11.5 **Hand spliced slings up to 32mm diameter shall not be used at site for any lifting purpose.**

21.11.6 **No load shall be slewed over public areas without stopping the pedestrians and road traffic first.**

21.11.7 **Requirements of outriggers**

i) All outriggers shall be fully extended and at all tyres are clear of the ground

ii) **Heavy duty blocking having large bearing area shall be necessary to prevent sinking of floats**

21.11.8 **All loads shall have tag-lines attached in order to ensure that the load can be controlled at all times.**

21.11.9 **No close working to any live overhead power line is permitted without the operation of a strict Permit to Work.**

21.11.10 **Minimum lighting is to be ensured at all lifting operations.**

21.12 **Failure to do any of the above shall attract penalty from the Employer as per relevant clause**

22.0 Launching Operation

22.1 As launching operation is one of the riskiest job, the contractor shall take utmost precaution at all stages like; planning, establishing casing yard, casting segments, transporting segments, fabrication and erection of launching girders, launching of segments, pre-stressing, auto launching of girders and dismantling of launching girders.

22.2 The contractor shall prepare a comprehensive Method Statement for the launching operation, adhering to the SHE conditions laid down in conditions of contract on SHE and project SHE manual. Particular reference shall be made to the provisions on working at height. As the entire process of launching has to be undertaken at an

elevated level, the safety of workers and the girder is paramount important. The following general guidelines shall be adhered throughout the launching operation.

i) Necessary 'working platforms' and fall protection anchorage arrangement shall be provided in the launching girder itself.

ii) Provisions for mounting light fittings shall also be made available in the launching girder.

iii) The casting yard shall be established ensuring the provision given in clause ***38.0***

iv) The workmen engaged in fabrication of reinforcement, concreting the segment shall be provided with necessary PPEs including compulsory hand protection gloves.

v) Casting and curing of segment shall be undertaken under the direct supervision of the responsible engineer of the contractor.

vi) Trucks with valid registration, licence, safe worthiness certificate, Employer's approval certificate, and pollution under check certificate shall only be used for transport of segments.

vii) All vehicle drivers including heavy vehicle operators shall be trained on defensive driving at Central Training Institute KSRTC, Shanthinagar Bangalore, or any other driving institute registered under Motor Vehicles Act.

viii) Drivers shall also have undergone proper medical examination as per relevant clause mentioned under 'Medical Facilities'.

ix) The segments shall rigidly secured to the truck with necessary wooden wedges and necessary red indicators/safety tapes provided so that the vehicle is clearly seen by other road users both in day / night time.

x) Every launching girder shall have a responsible engineer on duty all the time.

xi) All the time from erection to dismantling the area between the two piers wherein launching is in progress shall always be barricaded.

xii) Unloading of segments from trucks, lifting of segments, shifting of segments, gluing shall be done under the direct supervision of the approved engineer of the contractor.

xiii) Auto launching shall be done only after approval from the Employer. After every auto launching the stability of launching girder shall be ensured.

xiv) The vertical deflection of launching girder shall be monitored at all critical stages like with/without loads and after every auto launching.

xv) A register containing all important operational details from erection to dismantling of launching girders shall be maintained and made available to Employer whenever called for.

xvi) Test certificate for all lifting gears including Macalloy bars shall be maintained at a location closer to the launching girder itself so that it can be referred during all inspections.

xvii) Adequate lighting at all time shall be ensured in the entire area of operation.

xviii) Access to drinking water & toilet shall be ensured to all workmen engaged for launching process.

xix) Proper access ladders/stairways shall be maintained for safe ascending / descending of workmen / engineers.

22.3 **Non-adherence to any of the clauses mentioned above shall be viewed seriously by the Employer and penalty levied as per relevant clause.**

23.0 Construction machinery

23.1 Construction machineries may include dumpers and dump trucks, lift trucks and telescopic handlers piling rigs, vibro hammers, rail welding equipments, mobile elevating work platforms, cranes, tipper lorries, lorry loaders, skip wagons, 360° excavators, 180° backhoe loaders, crawler tractors, scrapers, graders, loading shovels, trenchers, side booms, pavers, planers, chippers, road rollers, locomotives, tankers and browsers, trailers, hydraulic and mechanical breakers etc.

23.2 Safe worthiness certificate

23.2.1 Every construction equipment shall be in sound mechanical working condition and certified by either competent person under Factories Act or manufacturers' warranty in case of brand new equipments or authorized persons / firms approved by Employer before induction to any site.

23.2.2 Every such certificate shall have the date of purchase, main overhauling undertaken in the past, any accident to the equipment, visual examination details, critical components safety check, list of safety devises and its working condition, manufacturer's maintenance checklist, past projects wherein the equipments were used etc as its minimum content.

23.3 **Reverse Horns**

23.3.1 **All Vehicles shall be fitted with audible reverse alarms and maintained in good working condition. Reversing shall be done only when there is adequate rear view visibility or under the directions of a banks man**

23.4 General operating procedures

i) Drivers entering site shall be instructed to follow the safe system of work adopted on site. These shall be verbal instructions or, preferably, written instructions showing the relevant site rules, the site layout, delivery areas, speed limits, etc.

ii) No passengers shall be carried, unless specific seating has been provided in accordance with the manufacturers' recommendations.

iii) Working on gradients beyond any equipments capability shall not be allowed.

iv) Prevention of dumper and dump truck accidents should be managed by providing wheel stops at a sufficient distance from the edges of excavations, spoil heaps, pits, etc.

v) The manufacturer's recommended bucket size must not be exceeded in excavators.

vi) If excavators operating on a gradient which cannot be avoided, it must be ensured that the working cycle is slowed down, that the bucket is not extended too far in the downhill direction, and that travel is undertaken with extreme caution. A large excavator must never be permitted to travel in a confined area, or around people, without a banks man to guide the driver, who should have the excavator attachment close in to the machine, with the bucket just clear of the ground. On wheeled excavators, it is essential that the tyres are in good condition and correctly inflated. If stabilizing devices are fitted, they should be employed when the machine is excavating.

vii) When the front shovel of the 180^0 backhoe loaders is being employed, the backhoe attachment shall be in its "travel" position, with the safety locking device in place.

viii) When operating the backhoe in poor ground conditions, the stabilisers tend to sink into the surface of the ground, reducing stability. Therefore frequent checks shall be made for the stability of the machine. The loading shovel should always be lowered to the ground to stabilise the machine when the backhoe is employed.

ix) The netting operation of the skip wagons should be carried out prior to lifting the skip to reduce the risks of working on the rear platform

x) If a tractor dozer is employed on clearing scrub or felling trees, it shall be provided with adequate driver protection.

xi) When two or more scrapers are working on the same job, a minimum distance of at least 25m shall be kept between them.

xii) In case of hydraulic breakers, hydraulic rams and hoses shall be in good working condition

23.5 All wood working machines shall be fitted with suitable guards and devices such as top guard, riving knife, push stick, guards for drive belts and chains, and emergency stop switch easily accessible by the operator.

23.6 **Penalty**

23.6.1 **If any of the above clauses are not adhered, penalty shall be imposed as per relevant clause depending upon the gravity of the unsafe act and or condition.**

24.0 Machine and general area guarding

24.1 The contractor shall ensure at the construction site all motors, cogwheels, chains and friction gearing, flywheels, shafting, dangerous and moving parts of machinery are securely fenced or legged. The fencing of dangerous part of machinery is not removed while such machinery is in motion or in use.

25.0 Manual lifting and carrying of excessive weight

25.1 The contractor shall ensure at his construction site of a building or other construction work that no building worker lifts by hand or carries overhead or over his back or shoulders any material, article, tool or appliances exceeding in weight as said below as per Rule 38 of BOCWR, Unless aided by another building worker or device.

Person	Maximum weight in kg.
Adult man	55
Adult woman	30

25.2 No building worker aided by other building worker shall lift or carry weight higher than or exceeding the sum of total of maximum limits set out for each building worker separately as mentioned in the table above.

26.0 Site Electricity

26.1 Competency of Electrical personnel:

26.1.1 **The contractor shall employ qualified and competent electrical personnel as specified in general instruction ***BMRC/SHE/CEO/001*****.**

26.2 Assessment of power

26.2.1 The contractor shall assess the size and location of the electrical loads and the manner in which they vary with time during the currency of the contract.

26.2.2 The contractor shall elaborate as to how the total supply is to be obtained / generated. The details of the source of electricity, earthing requirement, substation / panel boards, distribution system shall be prepared and necessary approval from Employer obtained before proceeding of the execution of the job.

26.2.3 **The main contractor shall take consideration, the requirements of the sub / petty contractors' electric power supply and arrive at the capacity of main source of power supply from diesel generators.**

26.2.4 **As the sub / petty contractors' small capacity generators create more noise and safety hazard, no small capacity diesel generators shall be allowed for whatsoever the type of job to be executed under this contract.**

26.2.5 **If any unsafe noise making small capacity diesel generators are found used by sub / petty contractors the main contractor shall only be penalised.**

26.3 **Work on site**

26.3.1 **The contractor shall also submit electrical single line diagram, schematic diagram and the details of the equipment for all temporary electrical installation and these diagrams together with the temporary electrical equipment shall be submitted to the Employer's for necessary approval. Failure to do so shall invite penalty as per relevant clause.**

26.4 Strength and capability of electrical equipment

26.4.1 No electrical equipment shall be put into use where its strength and capability may be exceeded in such a way as may give rise to danger.

26.5 Adverse or hazardous environments

26.5.1 Electrical equipment, which may reasonably foreseeable be exposed to-

(a) Mechanical damage;
(b) The effects of the weather, natural hazards, temperature or pressure;
(c) The effects of wet, dirty, dusty or corrosive conditions; or
(d) Any flammable or explosive substance, including dusts, vapours or gases, shall be of such construction or as necessary protected as to prevent, so far as is reasonably practicable, danger arising from such exposure.

26.6 **Distribution system:**

26.6.1 The contractor shall provide distribution system for control and distribution of electricity from a main AC supply of 50Hz for typical appliances,

i) Fixed plant – 400V 3 phase
ii) Movable plant fed via trailing cable over 3.75 kW – 400 3 phase
iii) Installation in site buildings – 230V single phase
iv) Fixed flood lighting – 230V single phase
v) Portable and hand tools – 115V single phase
vi) Site lighting - 115V single phase
vii) Portable hand lamps – 115V single phase

26.7 **Electrical protection circuits**

26.7.1 Precautions shall be taken, either by earthing or by other suitable means, to prevent danger arising when any conductor (other than a circuit conductor) which may reasonably foreseeable become charged as a result of either the use of a system, or a fault in a system, becomes so charged. A conductor shall be regarded as earthed when conductors of sufficient strength and current-carrying capability to discharge electrical energy to earth connect it to the general mass of earth.

If a circuit conductor is connected to earth or to any other reference point, nothing which might reasonably be expected to give rise to danger by breaking the electrical continuity or introducing high impedance shall be placed in that conductor unless suitable precautions are taken to prevent that danger.

26.7.2 Appropriate electrical protection shall be provided for all circuits, against over load, short circuit and earth fault current.

26.7.3 The contractor shall provide sufficient ELCBs (maintain sensitivity 30 mA) / RCCBs for all the equipments (including Potable equipments), electrical switchboards, distribution panels etc. to prevent electrical shocks to the workers.

26.7.4 All protection devices shall be capable of interrupting the circuit without damage to any equipments and circuits in case of any fault may occur.

26.7.5 Rating of fuses and circuit breakers used for the protection of circuits should be coordinate with equipment power ratings.

26.7.6 Protection against lightning shall be ensured to all equipment kept in open at sites.

26.8 **Cables:**

26.8.1 Cables shall be selected after full consideration of the condition to which they shall be exposed and the duties for which they are required. Supply cable up to 3.3 kV shall be in accordance with BS 6346.

26.8.2 For supplies to mobile or transportable equipment where operating of the equipment subjects the cable to flexing, the cable shall conform to any of these codes BS 6007 / BS 6500 / BS 7375.

26.8.3 Flexible cords with a conductor cross sectional area smaller than 1.5 mm^2 shall not be used and insulated flexible cable shall conform to BS 6500 and BS 7375.

26.8.4 Where low voltage cables are to be used, reference shall be made to BS 7375. The following standards shall also be referred to particularly for under ground cables BS 6346 and BS 6708

26.8.5 Cables buried directly in the ground shall be of a type incorporating armour or metal sheath or both. Such cables shall be marked by cable covers or a suitable marking tape and be buried at a sufficient depth to avoid their being damaged by any disturbance of the ground. Cable routes shall be marked on the plans kept in the site electrical register.

26.8.6 Cabling passing under the walk way and across way for transport and mobile equipment shall be laid in ducts at a minimum depth of 0.6 meters.

26.8.7 Cables that need to cross open areas, or where span of 3m or more are involved, a catenary wire on poles or other supports shall be provided for convenient means of suspension. Minimum height shall be 6 m above ground.

26.8.8 Cables carrying a voltage to earth in excess of 65V other than supply for welding process shall have metal armour or sheath, which has been effectively earthed and monitored by the contractor. In case of flexible and trailing cables such earthed metal sheath and/or armour should be in addition to the earth core in the cable and shall not be used as the protective conductor.

26.8.9 Armoured cables having an over-sheath of polyvinyl chloride (PVC) or an oil resisting and flame retardant compound shall be used whenever there is a risk of mechanical damage occurring

26.9 **Plugs, socket-outlets and couplers:**

26.9.1 **The contractor shall ensure plugs, socket-outlets, and couplers available in the construction site as "splash proof" type. The minimum degree of Ingress Protection should be of IP44 in accordance with BS EN 60529**.

26.9.2 Only plugs and fittings of the weatherproof type shall be used and they should be colour coded in accordance with the Internationally recognised standards for example as detailed as follows:

(a) 110 volts : Yellow.

(b) 240 volts : Blue.

(c) 415 volts : Red.

26.10 **Connections**

26.10.1 **Every joint and connection in a system shall be mechanically and electrically suitable for use to prevent danger. Proper cable connectors as per national/international standards shall only be used to connect cables.**

26.10.2 **No loose connections or tapped joints shall be allowed any where in the work site, office area, stores and other areas. Penalty as per relevant clause shall be put in case of observation of any tapped joints.**

26.11 Portable and hand-held equipments:

26.11.1 The contractor shall ensure the use of double insulated or all-insulated portable electrical hand equipment may be used without earthing (i.e. two core cables), but they shall still be used only on 110V because of the risk of damage to trailing leads.

26.12 Other equipments:

26.12.1 All equipment shall have the provision for major switch/cut-off switch in the equipment itself.

26.12.2 All non-current carrying metal parts of electrical equipment shall be earthed through insulated cable

26.12.3 Isolate exposed high-voltage (over 415 Volts) equipment, such as transformer banks, open switches, and similar equipment with exposed energized parts and prevent unauthorised access.

26.12.4 Approved perimeter markings shall be used to isolate restricted areas from designated work areas and entryways and shall be erected before work begins and maintained for entire duration of work. Approved perimeter marking shall be installed with either red barrier tape printed with the words "DANGER—HIGH VOLTAGE" or a barrier of yellow or orange synthetic rope, approximately 1 to 1.5 meter above the floor or work surface.

26.13 **Work on or near live conductors**

26.13.1 No person shall be engaged in any work activity on or so near any live conductor (other than one suitably covered with insulating material so as to prevent danger) that danger may arise unless-

a) It is unreasonable in all the circumstances for it to be dead; and
b) It is reasonable in all the circumstances for him to be at work on or near it while it is live; and
c) Suitable precautions (including where necessary the provision of suitable protective equipment) are taken to prevent injury.

26.14 **Inspection and Maintenance**

26.14.1 All electrical equipment should be permanently numbered and a record kept of the date of issue, date of last inspection and recommended inspection period.

26.14.2 Fixed installations shall be inspected at least at three monthly intervals; routine maintenance being carried out in accordance with equipment manufactures recommendations.

27.0 Lighting:

27.1 The contractor shall provide sufficient site lighting, of the right type and at the right place for it to be properly effective. Lighting ought not to introduce the risk of electric shock. Therefore, 230V supplies should be used for those fittings, which are robustly installed, and well out of reach e.g. flood lighting or high-pressure discharge lamps.

27.2 Selection of Luminaries:

The contractor shall select the luminaries as per the area requirement indicated below:

Sl. No.	Type of Lighting	Area of Requirement	Luminaries
1.	Area Lighting	Workmen and vehicles to move about in safely.	i) Shovel type: non-symmetrical ii) Symmetrical or non-symmetrical tungsten halogen
2.	Beam flood lighting	Concentrated light over an area from a relatively great distance.	i) Portable flood light (Conical beam) ii) Wide angle flood (fan shaped beam) iii) Medium or narrow angle flood (Conical beam)
3.	Dispersive lighting	Lighting for indoor	i) Dispersive (Mercury florescent) ii) Cargo cluster iii) Florescent trough
4.	Walkway lighting	Lighting for stairways, ladder ways, corridors, scaffold access routs, etc.	i) Well glass unit ii) Bulkhead unit (tungsten filament) iii) Bulk head unit (Florescent)
5.	Local lighting	Lighting on sites and fittings are generally accessible to operatives	i) PAR (Parabolic Aluminised Reflector) lamp cluster ii) Festoons (with or without shades) iii) Adjustable florescent work lamp iv) Portable flood lamp (mounted on own cable drum)

27.3 The contractor shall ensure that luminaries should always be placed so that no person is required to work in their own shadow and so that the local light for one person is not a source of glare for the others. Strongly made clamps should be available for attaching luminaries to poles and other convenient supports.

27.4 Luminaries should be robust, resistant to corrosion and rain proof especially at the point of the cable entry.

27.5 The correct type of lamp for each luminaries should always be used and when lamps need to be replaced if shall be in accordance with the supply voltage.

27.6 Lamp holders not fitted with a lamp should be capped off.

27.7 The contractor shall take every effort to illuminate the work site as per the Employer's requirement illustrated in general instruction ***BMRC/SHE/CEO/0011***.

28.0 Hand Tools and Power Tools

28.1 General

28.1.1 The contractor is wholly responsible for the safe condition of tools and equipment used by his employees and that of his sub-contractors.

28.1.2 Use of short / damaged hand tools shall be avoided and the contractor shall ensure all his hand tools used at his worksite are safe to work with or stored and shall also train his employees (including his sub-contractors) for proper use thereby.

28.1.3 All hand tools and power tools shall be duly inspected before use for safe operation.

28.1.4 All hand tools and power tools shall have sufficient grip and the design specification on par with national/international standards on anthropometrics.

28.2 Hand tools

28.2.1 Hand tools shall include saws, chisels, axes and hatches, hammers, hand planes, screw drivers, crow bars, nail pullers.

28.2.2 The contractor shall ensure that,

i) For crosscutting of hardwood, saws with larger teeth points (no. of points per inch) shall be preferred to avoid the saw jumping out of the job.
ii) Mushroom headed chisels shall not be used in the worksite where the fragments of the head may cause injury.
iii) Unless hatchet has a striking face, it shall be used as a hammer.
iv) Only knives of retractable blades shall be used in the worksite.
v) No screwdrivers shall be used for scraping, chiselling or punching holes.
vi) A pilot hole shall always be driven before driving a screw.
vii) Wherever necessary, usage of proper PPEs shall be used by his employees.

28.3 Power tools

28.3.1 Power tools include drills, planes, routers, saws, jackhammers, grinders, sprayers, chipping hammers, air nozzles and drills.

28.3.2 The contractor shall ensure that

i) Electric tools are properly grounded or / and double insulated.
ii) GFCIs/ RCCBs shall be used with all portable electric tool operated especially outdoors or in wet condition.
iii) Before making any adjustments or changing attachments, his workers shall disconnect the tool from the power source.
iv) When operating in confined spaces or for prolonged periods, hearing protection shall be required. The same shall also apply to working with equipments, which gives out more noise as mentioned in clause ***43.0*** of this contract document.
v) Tool is held firmly and the material is properly secured before turning on the tool.

vi) All drills shall have suitable attachments respective of the operations and powerful for ease of operation.

vii) When any work / operation need to be performed repeatedly or continuously, tools specifically designed for that work shall be used. The same is applicable to detachable tool bit also.

viii) Size of the drill shall be determined by the maximum opening of the chuck n case of drill bit.

ix) Attachments such as speed reducing screwdrivers and buffers shall be provided to prevent fatigue and undue muscle strain to his workers.

x) Stock should be clamped or otherwise secured firmly to prevent it from moving.

xi) Workers shall never stand on the top of the ladder to drill holes in walls / ceilings, which can be hazardous, instead standing on the fourth or fifth rung shall be recommended.

xii) Electric plane shall not be operated with loose clothing or long scarf or open jacket.

xiii) Safety guards used on right angle head or vertical portable grinders must cover a minimum of 180^0 of the wheel and the spindle / wheel specifications shall be checked.

xiv) All power tools / hand tools shall have guards at their nip points.

xv) Low profile safety chain shall be used in case of wood working machines and the saw shall run at high rpm when cutting and also correct chain tension shall be ensured to avoid “kickback”.

xvi) Leather aprons and gloves shall be used as an additional personal protection auxiliary to withstand kickback.

xvii) Push sticks shall be provided and properly used to hold the job down on the table while the heels moves the stock forward and thus preventing kickbacks.

xviii) Air pressure is set at a suitable level for air actuated tool or equipment being used. Before changing or adjusting pneumatic tools, air pressure shall be turned off.

xix) Only trained employees shall use explosive actuated tools and the tool shall also be unloaded when not in use.

xx) Usage of such explosive actuated tools shall be avoided in case of places where explosive/flammable vapours or gases may be present.

xxi) Explosive actuated tools and their explosives shall be stored separately and be taken out and loaded only before the time of immediate use.

xxii) Misfired cartridges of explosive actuated tools must be placed in a container of water and be removed safely from the project.

xxiii) No worker shall point any power operated / hand tool to any other person especially during loading / unloading.

29.0 Welding, Gouging and Cutting

29.1 Gas cylinders in use shall be kept upright on a custom-built stand or trolley fitted with a bracket to accommodate the hoses and equipment or otherwise secured. The metal cap shall be kept in place to protect the valve when the cylinder is not connected for use.

29.2 Hose clamp or clip shall be used to connect hoses firmly in both sides of cylinders and torches.

29.3 All gas cylinders shall be fixed with pressure regulator and dial gauges

29.4 Non-return valve and Flashback arrester shall be fixed at both end of cylinder and torch.

29.5 Domestic LPG cylinders shall not be used for Gas welding and Cutting purpose.

29.6 DCP or CO_2 type Fire Extinguisher not less than 5 kg shall be fixed at or near to welding process zone in an easily accessible location. Fire Extinguisher should confirm to IS 2190: 1992.

29.7 Use firewatchers if there is a possibility of ignition unobserved by the operator (e.g. on the other side of bulkheads).

29.8 Oxygen cylinders and flammable gas cylinders shall be stored separately, at least 6.6 meters (20 feet) apart or separated by a fire proof, 1.5 meters (5 feet) high partition. Flammable substances shall not be stored within 15 meters of cylinder storage areas.

29.9 Transformer used for electrical arc welding shall be fixed with Ammeter and Voltmeter and also fixed with separate main power switch.

29.10 Welding grounds and returns should be securely attached to the work by cable lugs, by clamps in the case of stranded conductors, or by bolts for strip conductors. The ground cable will not be attached to equipment or existing installations or apparatus.

29.11 Use a low voltage open circuit relay device if welding with alternating current in constricted or damp places.

29.12 Take precautions against the risk of increased fume hazards when welding with chrome containing fluxed consumables or high current metal inert gas (MIG) or tungsten inert gas (TIG) processes.

29.13 Avoid being in contact with water or wet floors when welding. Use duckboards or rubber protection.

29.14 All electrical installations shall meet the IS: 5571: 1997 and NFPA 70 for gas cylinder storage area and other hazardous areas.

29.15 The current for Electric arc welding shall not exceed 300 A on a hand welding operation.

30.0 Dangerous and harmful environment

As per BOCWR Rule 40,

i) When internal combustion engines are to be used into a confined space or excavation or tunnel or any other workplace where neither natural or artificial ventilation system is inadequate to keep carbon monoxide below 50ppm, exposure of building workers shall be avoided unless suitable measures are taken and provided by the contractor.

ii) No worker shall be allowed into any confined space or tank or trench or excavation wherein there is given off any dust, fumes / vapours or other impurities which is likely to be injurious or offensive, explosive or poisonous

or noxious or gaseous material or other harmful articles unless steps are carried out by the contractor and certified by the responsible person to be safe.

31.0 Fire prevention, protection and fighting system

31.1 **The contractor shall ensure that construction site is provided with fire extinguishing equipment sufficient to extinguish any probable fire at construction site. An adequate water supply is provided at ample pressure as per national standard.**

31.2 Recharging of fire extinguishers and their proper maintenance should be ensured and as a minimum should meet Indian National Standards

31.3 All drivers of vehicles, foreman, supervisors and managers shall be trained on operating the fire extinguishers and fire fighting equipment.

31.4 The contractor shall also give consideration to the provision of adequate fire fighting arrangements within the underground and tunnelling operations including the provision of Fire Service compatible hose connections and emergency lighting

31.5 As per the BOCWK Rules 2006, Rule 79(a)(vii), all lifting appliances' driver cabin should be provided with a suitable portable fire extinguisher.

31.6 Combustible scrap and other construction debris should be disposed off site on a regular basis. If scrap is to be burnt on site, the burning site should be specified and located at a distance no less than 12 metres from any construction work or any other combustible material.

31.7 Every fire, including those extinguished by contractor personnel, shall be reported to the Employer representatives.

31.8 Emergency plans and Fire Evacuation plans shall be prepared and issued. Mock drills should be held on a regular basis to ensure the effectiveness of the arrangements and as a part of the programme, the Telephone Number of the local fire brigade should be prominently displayed near each telephone on site.

32.0 Corrosive substances

32.1 As per BOCWR Rule 44, corrosive substances including alkalis and acids shall be stored and used by a person dealing with such substances at a building / construction site in a manner that it does not endanger the building worker and suitable PPE shall be provided by the contractor to the worker during such handling and work. In case of spillage of such substances on building worker, the contractor shall take immediate remedial measures.

33.0 Demolition

33.1 The Contractor shall ensure that

i) All demolition works be carried out in a controlled manner under the management of experienced and competent supervision.

ii) The concerned department of the Government or local authority be informed and permission obtained wherever required. Media shall also be informed regarding this concern.

iii) **All glass or similar materials or articles in exterior openings are removed before commencing any demolition work and all water, steam, electric, gas and other similar supply lines are put-off and such lines so located or capped with substantial coverings so as to protect it from damage and to afford safety to the building workers and public..**

iv) Examine the walls of all structures adjacent to the structure to be demolished to determine thickness, method of support to such adjacent structures

v) No demolishing work be performed if the adjacent structure seems to be unsafe unless and until remedial measures life sheet piling, shoring, bracing or similar means be ensured for safety and stability for adjacent structure from collapsing.

vi) Debris / bricks and other materials or articles shall be removed by means of
a) chutes
b) buckets or hoists
c) through openings through floors or
d) any other safe means

vii) No person other than building workers or other persons essential to the operation of demolition work shall be permitted to enter a zone of demolition and the area be provided with substantial barricades.

34.0 Excavation and Tunnelling:

34.1 Excavation

34.1.1 The contractor shall ensure

i) Where any construction building worker engaged in excavation is exposed to hazard of falling or sliding material or article from any bank or side of such excavation which is more than one 1.5 m above his footing, such worker is protected by adequate piling and bracing against such bank or side.

ii) Where banks of an excavation are undercut, adequate shoring is provided to support the material or article overhanging such bank.

iii) Excavated material is not stored at least 0.65 m from the edge of an open excavation or trench and banks of such excavation or trench are stripped of loose rocks and the banks of such excavation or trench are stripped of loose rocks and other materials which may slide, roll or fall upon a construction building worker working below such bank

iv) Metal ladders and staircases or ramps are provided, as the case may be, for safe access to and egress from excavation where, the depth of such excavation exceeds 1.5 m and such ladders, staircases or ramps comply with the IS 3696 Part 1&2 and other relevant national standards.

v) Trench and excavation is protected against falling of a person by suitable measures if the depth of such trench or excavation exceeds 1.5 m and such protection is an improved protection in accordance with the design and drawing of a professional engineer, where such depth exceeds 4m.

34.2 Tunnelling

34.2.1 The contractor shall inform in writing to the Director General within 30 days, prior to the commencement of any tunnelling work.

34.2.2 The contractor shall appoint a responsible person for safe operation for tunnelling work as per Rule 121 & 125 of BOCWR.

34.2.3 The contractor shall ensure

i) Every compressed air system in a tunnel is provided with emergency power supply for maintained continued supply of compressed air as per Rule 155 of BOCWR

ii) Watertight bulkhead doors are installed at the entrance of a tunnel to prevent flooding.

iii) Reliable and effective means of communication such as telephone or walkie-talkie are provided and maintained for arranging better effective communication at an excavation or tunnelling work as per Rule 136 of BOCWR.

iv) All portable electrical hand tools and inspection lamp used in underground and confined space at an excavation or tunnelling work is operated at a voltage not exceeding 24V.

v) Only flame proof equipment of appropriate type as per IS: 5571:2000 and or other relevant national standard is used inside the tunnel

vi) Petrol or LPG of any other flammable substances are not used, stored inside the tunnel except with prior approval from Employer, and also no oxy-acetylene gas is used in a compressed air environment in excavation or tunnelling

vii) Adequate number of water outlets provided for firefighting purpose, an audible fire alarm and adequate number and types of fire extinguishers are provided and maintained.

viii) Temperature in any working chamber in an excavation or tunnelling work where workers employed does not exceed 29°C as per Rule 165 of BOCWR.

ix) All working areas in a free air tunnel are provided with ventilation system as approved by the Director General and the fresh air supplied in such tunnel is not less than 6 m^3/ min for each worker employed in tunnel as per Rule 153 of BOCWR.

34.3 Warning signs and notices:

34.3.1 The contractor shall ensure that

i) Suitable warning signs or notices, required for the safety of building workers carrying out the work of an excavation or tunnelling, shall be displayed or erected at conspicuous places in Hindi and in a language understood by majority of such building workers at such building such excavation or tunnelling work

ii) Such warning signs and notices with regard to compressed air working shall include

a) the danger involved in such compressed air work
b) fire and explosion hazard
c) the emergency procedures for rescue from such danger or hazards.

35.0 Work Permit system

35.1 The Contractor shall develop a Work Permit system, which is a formal written system used to control certain types of work that are potentially hazardous. A work permit is a document, which specifies the work to be done, and the precautions to be taken. Work Permits form an essential part of safe systems of work for many construction activities. They allow work to start only after safe procedures have been defined and they provide a clear record that all foreseeable hazards have been considered. Permits to Work are usually required in high-risk areas as identified by the Risk Assessments.

35.2 A permit is needed when construction work can only be carried out if normal safeguards are dropped or when new hazards are introduced by the work. Examples of high-risk activities include but are not limited to:

i) Entry into confined spaces
ii) Work in close proximity to overhead power lines and telecommunication cables.
iii) Hot work.
iv) To dig—where underground services may be located.
v) Work with heavy moving machinery.
vi) Working on electrical equipment
vii) Work with radioactive isotopes.
viii) Heavy lifting operations and lifting operations closer to live power line

35.3 The permit-to-work system should be fully documented, laying down:

i) How the system works;
ii) The jobs it is to be used for;
iii) The responsibilities and training of those involved; and
iv) How to check its operation;

35.4 A Work Permit authorisation form shall be completed with the maximum duration period not exceeding 12 hours.

35.5 A copy of each Permit To Work shall be displayed, during its validity, in a conspicuous location in close proximity to the actual works location to which it applies.

36.0 Traffic Management

36.1 The basic objective of the following guidelines is to lay down procedures to be adopted by contractor to ensure the safe and efficient movement of traffic and also to ensure the safety of workmen at construction sites.

36.2 All construction workers should be provided with high visibility jackets with reflective tapes as most of viaduct /tunnelling and station works or either above or under

right-of-way. The conspicuity of workmen at all times shall be increased so as to protect from speeding vehicular traffic.

36.3 The guiding principles to be adopted for safety in construction zone are to

i) Warn the road user clearly and sufficiently in advance.

ii) Provide safe and clearly marked lanes for guiding road users.

iii) Provide safe and clearly marked buffer and work zones

iv) Provide adequate measures that control driver behaviour through construction zones.

36.4 Legal permission

36.4.1 In all cases, the contractor shall employ proper precautions. Wherever operations undertaken are likely to interfere with public traffic, specific traffic management plans shall be drawn up and implemented by the contractor in consultation with the approval of local police authorities and/or the concerned metropolitan/civil authorities as the case may be.

36.4.2 Such traffic management plans shall include provision for traffic diversion and selection of alternative routes for transport of equipment. If necessary, the contractor shall carry out road widening before commencement of works to accommodate the extra load

36.5 The primary traffic control devices used in work zones shall include signs, delineators, barricades, cones, pylons, pavement markings and flashing lights.

36.6 The road construction and maintenance signs which fall into the same three major categories as do other traffic signs, that are Regulatory Signs, Warning Signs and Direction (or guidelines) Signs shall only be used. The IRC: 67 (Code of Practice for Road Signs) provide a list of traffic signs. The size, colours and placement of sign shall confirm to IRC: 67.

36.7 Regulatory signs

36.7.1 Regulatory signs impose legal restriction on all traffic. It is essential, therefore, that they are used only after consulting the local police and traffic authorities.

36.8 Warning signs

36.8.1 Warning signs in the traffic control zone shall be utilised to warn the drivers of specific hazards that may be encountered.

36.8.2 The contractor shall place detour signage at strategic locations and install appropriate warning signs. In order to minimize disruption of access to residences and business, the contractor shall maintain at least one entrance to a property where multiple entrances exist.

36.8.3 A warning sign as given in general instruction ***BMRC/SHE/CEO/012*** shall be installed an at all secondary road which merges with the primary road where the construction work is in progress at sufficient distance before it merges with the primary road so as to alert the road users regarding the ‘Metro Work in Progress’.

36.8.4 Materials hanging over / protruded from the chassis / body of any vehicle especially during material handling shall be indicated by red indicator (red light/flag) to indicate the caution to the road users.

36.9 Delineators

The delineators are the elements of a total system of traffic control and have two distinct purposes:

i) To delineate and guide the driver to and along a safe path

ii) As a taper to move traffic from one lane to another.

36.9.1 These channelizing devices such as cones, traffic cylinders, tapes and drums shall be placed in or adjacent to the roadway to control the flow of traffic. These should normally be retro-reflectors complying to IRC: 79 - Recommended Practice for Road Delineators.

36.9.2 Traffic cones and cylinders

36.9.2.1 Traffic cones of 500mm, 750mm and 1000mm high and 300mm to 500mm in diameter or in square shape at base and are often made of plastic or rubber and normally have retro-reflectorised red and white band shall be used wherever required.

36.9.3 Drums

36.9.3.1 Drums about 800mm to 1000mm high and 300mm in diameter can be used either as channelizing or warning devices. These are highly visible, give the appearance of being formidable objects and therefore command the respect of drivers.

36.9.4 Barricades

36.9.4.1 Full height fence, barriers, barricades etc. shall be erected around the site in order to prevent the working area from the risk of accidents due to speedy vehicular movement. Same the way barricades protect the road users from the danger due to construction equipment and other temporary structures.

36.9.4.2 The structure dimension of the barricade, material and composition, its colour scheme, BMRC logo and other details shall be in accordance with specifications laid down in tender document.

36.9.4.3 All barricades shall be erected as per the design requirements of the Employer, numbered, painted and maintained in good condition and also Barricade in-charge maintains a barricade register in site.

36.9.4.4 **All barricades shall be conspicuously seen in the dark/night time by the road users so that no vehicle hits the barricade. Conspicuity shall be ensured by affixing retro reflective stripes of required size and shape at appropriate angle at the bottom and middle portion of the barricade at a minimum gap of 1000mm. In addition minimum one red light or red light blinker should be placed at the top of each barricade.**

36.9.5 The contractor shall ensure that all his construction vehicles plying on public roads (like dump trucks, trailers, etc.) have proper license to ply on public roads from the

State Transport Authority. Drivers holding proper valid license as per the requirements of Motor Vehicles Act shall drive these vehicles

36.9.6 The contractor shall not undertake loading and unloading at carriageways obstructing the free flow of vehicular traffic and encroachment of existing roads by the contractor applying the excuse of work execution.

36.9.7 **Tow away vehicle**

36.9.7.1 **The contractor shall make arrangements keeping tow away van / manpower to tow away any breakdown vehicle in the traffic flow without loosing any time at his cost.**

36.9.8 **Cleaning of roads**

36.9.8.1 The contractor shall ensure the cleanliness of roads and footpaths by deploying proper manpower for the same. The contractor shall have to ensure proper brooming, cleaning washing of roads and footpaths on all the time throughout the entire stretch till the currency of the contract including disposal of sweepage.

37.0 Work to adjacent railways

37.1 Whenever work is to be conducted in close proximity to the live railways then the following measures shall need to be addressed:

(a) The rules provided for in the Railway's manual should be followed.

(b) No persons are allowed to encroach onto the railway unless the owner has given specific authority.

(c) Adequate protection in accordance with the railway owner's requirements shall be followed. (Provision of Block Inspectors, Flagmen and Lookouts)

(d) All persons shall wear high visibility clothing at all times.

(e) Any induction training requirements of the railways shall be strictly observed

38.0 Batching Plant and Casting Yard layout

i) The batching plant / casting yard shall be effectively planned for smooth flow of unloading and stacking the aggregates reinforcements and cement, batching plant, transport of concrete, casting the segment, stacking the segment and loading the segments to the trucks. As far as possible the conflicts should be avoided.

ii) The batching plant / casting yard shall be barricaded and made as a compulsory PPE zone

iii) If in case of material unloading area is not maintainable as PPE zone, the same shall be segregated properly and made as a non-PPE zone with appropriate barrications.

iv) Electrical system shall also be suitably planned so that location of diesel generator, if any, location of DBs, routing of cables and positioning of area lighting poles/masts does not infringe on any other utility and pose danger.

v) Drainage shall be effectively provided and waste water shall be disposed after proper treatment

vi) Time office, canteen, drinking water, toilet and rest place shall be suitably located for the easy access to workers. All the facilities shall be properly cleaned and maintained during the entire period of operation.

vii) Manual handling of cement shall be avoided to a larger extent. Whenever it is absolutely necessary the workmen shall be given full body protection, hand protection and respiratory protection as a basic measure of ensuring better health.

viii) The PPEs provided to cement handling workmen shall conform to international standards.

ix) Access roads and internal circulation roads shall be well laid and maintained properly at all time.

x) Non-adherence to any of the above provision shall be penalised as per relevant penalty clause.

39.0 Personal Protective Equipments (PPEs)

39.1 The contractor shall provide required PPEs to workmen to protect against safety and / or health hazards. Primarily PPEs are required for the following protection

i) Head Protection (Safety helmets)
ii) Foot Protection (Safety footwear, Gumboot, etc)
iii) Body Protection (High visibility clothing (waistcoat/jacket), Apron, etc)
iv) Personal fall protection (Full body harness, Rope-grap fall arrester, etc)
v) Eye Protection (Goggles, Welders glasses, etc)
vi) Hand Protection (Gloves, Finger coats, etc)
vii) Respiratory Protection. (Nose mask, SCBAs, etc)
viii) Hearing Protection (Ear plugs, Ear muffs, etc)

39.2 **The PPEs and safety appliances provided by the contractor shall be of the standard as prescribed by Bureau of Indian Standards (BIS). If materials conforming to BIS standards are not available, the contractor as approved by the Employer shall procure PPE and safety appliances.**

39.3 **All construction workers should be provided with high visibility jackets with reflective tapes confirming to the requirement specified under BS EN 471: 1994 as most of viaduct /tunnelling and station works are executed either above or under right-of-way. The conspicuity of workmen at all times shall be increased so as to protect them from speeding vehicular traffic.**

39.4 The contractor shall provide **safety helmet, safety shoe and high visibility clothing** for all employees including workmen, traffic marshal and other employees who are engaged for any work under this contract as per the following requirement.

All employees of the Contractor including workmen	Traffic marshals
i) Hard hat with company Logo	i) Hard hat with reflective tape
ii) Safety boots	ii) Safety boots
iii) Hi-visibility **waistcoat** covering upper body and meeting the following requirements as per BS EN 471:1994:	iii) Hi-visibility **jacket** covering upper body and meeting the following requirements as per BS EN 471:1994 :

a) Background in fluorescent orange-red in colour b) Two vertical green strips of 5cm wide on front side, covering the torso at least 500 cm^2 c) Two diagonal strips of 5 cm wide on back in an 'X' pattern covering at least 570cm^2 d) Horizontal strips not less than 5cm wide running around the bottom of the vertical strip in front and 'X' pattern at back. e) The bottom strip shall be at a distance of 5cm from the bottom of the vest. f) Strips must be retro reflective and fluorescent g) Waistcoat shall have a side adjustable fit and a side and front tear-away feature on vests made of nylon.	a) Background in fluorescent orange-red in colour b) Jackets with full-length sleeves with two bands of retro reflective material, which shall be placed at the same height on the garment as those of the torso. The upper band shall encircle the upper part of the sleeves between the elbow and the shoulder; the bottom of the lower band shall not be less than 5cm from the bottom of the sleeve. c) Two vertical green strips of 5cm wide on front side, covering the torso at least 500 cm^2 d) Two diagonal strips of 5 cm wide on back in an 'X' pattern covering at least 570cm^2 e) Horizontal strips not less than 5cm wide running around the bottom of the vertical strip in front and 'X' pattern at back. f) The bottom strip shall be at a distance of 5cm from the bottom of the vest. g) Strips must be retro reflective and fluorescent.

39.4.1 **Colour coding for helmets**

Safety Helmet Colour Code (Every Helmet should have the LOGO* affixed /painted)	**Person to use**
White	**BMRCL staffs**
Grey	**All Designers, Architect, Consultants, etc.**
Violet	**Main Contractors (Engineers / Supervisors)**
Blue	**All Sub-contractors (Engineers / Supervisors)**
Red	**Electricians (Both Contractor and Sub-contractor)**
Green	**Safety Professionals (Both Contractor and Sub-contactor)**
Orange	**Security Guards / Traffic marshals**
Yellow	**All workmen**
White (with "VISITOR" sticker)	**Visitors**

Note: LOGO*

1. Logo shall have its outer dimension 2”X2” and shall be conspicuous
2. Logo shall be either painted or affixed
3. No words shall come either on Top / Bottom of Logo

Logo of the corresponding main contracting company for their employees and sub-contracting company for their employees shall only be used.

39.5 In addition to the above any other PPE required for any specific jobs like, welding and cutting, working at height, tunnelling etc shall also be provided to all workmen and also ensure that all workmen use the PPEs properly while on the job.

39.6 **The contractor shall not pay any cash amount in lieu of PPE to the workers/sub-contractors and expect them to buy and use during work.**

39.7 **The contractor shall at all time maintain a minimum of 10% spare PPEs and safety appliances and properly record and show to the Employer during the inspections. Failing to do so shall invite appropriate penalty as per the provisions of the contract.**

39.8 It is always the duty of the contractor to provide required PPEs for all visitors. Towards this required quantity of PPEs shall be kept always at the security post.

40.0 Visitors to site

40.1 No visitor is allowed to enter the site without the permission of the Employer. All authorised visitors should report at the site office. Contractor shall provide visitor’s helmet (White helmet with visitor sticker) and other PPEs like Safety Shoe, reflective jacket, respiratory protection etc. as per requirement of the site.

40.2 All Visitors shall be accompanied at all times by a responsible member of the site personnel.

40.3 The contractor shall be fully responsible for all visitors’ safety and health within the site..

40.4 As indicated earlier in this Manual, the Engineer shall undertake regular audits at quarterly intervals, of the Contractor’s onsite practices and procedures as a means of assessing the ongoing performance of the Contractor.

40.5 The criteria against which the audits will be undertaken shall be derived from the clauses within the Environment Protection Requirements (Appendix III herein above), contract-specific Site Environmental Plan and previous site inspection results.

40.6 In addition to the quarterly audits by the Engineer, site inspection shall be undertaken by the Contractor’s staff to inspect the construction activities in order to ensure that appropriate environmental protection and pollution control measures are properly followed and implemented.

40.7 The frequency of site inspection shall be at least once a week.

40.8 The Contractor shall prepare an ‘Environmental Inspection and Action Reporting

System' and submit to the Engineer for approval and make amendments as suggested. It shall contain a contract specific comprehensive Environment Inspection checklist as requirement of Site Environmental Plan.

40.9 The area of inspection shall not be limited to environmental compliance within the site but areas outside the site which are likely to be affected, directly or indirectly by activities at site.

40.10 Results of inspection shall be discussed with Engineer and his recommendations on better environmental protection shall be notified to the Contractor for taking immediate action and rapid resolution of identified non-compliance.

40.11 If significant environmental problems are identified or if there is an environmental complaint or as a part of investigation work, then the Engineer shall also carry out Ad hoc site inspection which shall be attended by Contractor's Representative.

40.12 REPORTING SYSTEM

40.12.1 Reporting under the Environmental Management System will contain results of monitoring and inspection programs.

40.12.2 In Site Environmental Plan, the Contractor shall prepare and submit monthly Environmental Quality Management Reports in accordance with Requirements as per Contract.

40.12.3 The monthly report shall include (but not limited to) the following:

- Executive Summary
- Brief mention of construction activities
- Monitoring results under AMCP, and NMCP *(Noise Monitoring Deleted)*
- Interpretation of monitoring results, significance and influencing factors
- Graphical representation of monitored results over past four reporting periods.
- Measures to control spill under SPCP.
- Action taken on recommendations under site inspection programme or specific directions.
- Summary of complaints, results of investigations and follow-up action
- Future key issues.

40.13 COMPLAINT RESPONSE PROCESS

40.13.1 Inquiries, complaints and requests for information can be expected from a wide range of individuals and organizations both private and government. The majority of complaints is likely to be received by BMRTL, although the site offices are also likely to be contacted.

40.13.2 The objective of complaint process is to ensure that public and agency complaints are addressed and resolved consistently and expeditiously.

40.13.3 The Contractor's Site Manager will be notified immediately on receipt of complaint that may relate to environmental impacts. The Site Manager will immediately inform the Engineer and through him the BMRTL.

40.13.4 Field investigation should determine whether the complaint has merit, and if so action should be taken to address the impact.

40.13.5 The outcome of the investigation and the action taken shall be documented on a complaint Performa prepared by the Contractor and approved by the Engineer in advance of the works.

40.13.6 Where possible, a formal response to each complaint received shall be prepared by the Contractor within seven days in order to notify the concerned person(s) that action has been taken.

40.14 COMPLETION OF THE EQM PROGRAMME

40.14.1 The construction of Bangalore Metro will be undertaken as a series of individual construction contracts with necessarily different construction program and completion dates.

40.14.2 The Engineer shall maintain an overview of the 'impact causing potential' of each site or contract and monitoring parameter with a view to maintaining the most cost effective use of the environmental resources dedicated to the Project.

40.14.3 Termination of EQM should focus on the percentage contract completion status and on the basis of a history of environmental impact arising from the site over a representative period of monitoring.

40.13.5 Justifiable application for termination of EQM shall be put forward by the Contractor to the Engineer, as necessary throughout the construction period.

PART – III: OCCUPATIONAL HEALTH AND WELFARE

41.0 Physical fitness of workmen

41.1 The contractor shall ensure that his employees/workmen subject themselves to such medical examination as required under the law or under the contract provision and keep a record of the same.

41.2 The contractor shall not permit any employee/workmen to enter the work area under the influence of alcohol or any drugs.

42.0 Medical Facilities

42.1 Medical Examination

42.1.1 The contractor shall arrange a medical examination of all his employees including his sub-contractor employees employed as drivers, operators of lifting appliances and transport equipment before employing, after illness or injury, if it appears that the illness or injury might have affected his fitness and, thereafter, once in every two years up to the age of 40 and once in a year, thereafter.

i) The Contractor shall maintain the confidential records of medical examination or the physician authorized by the Employer.

ii) No building or other construction worker is charged for the medical examination and the cost of such examination is borne by contractor employing such building worker.

iii) The medical examination shall include: -

a) Full medical and occupational history.

b) Clinical examination with particular reference to

i) General Physique;

ii) Vision:- Total visual performance using standard orthorator like Titmus Vision Tester should be estimated and suitability for placement ascertained in accordance with the prescribed job standards.

iii) Hearing: - Persons with normal must be able to hear a forced whisper at twenty-four feet. Persons using hearing aids must be able to hear a warning shout under noisy working conditions.

iv) Breathing:- Peak flow rate using standard peak flow meter and the average peak flow rate determined out of these readings of the test performed. The results recorded at pre-placement medical examination could be used as a standard for the same individual at the same altitude for reference during subsequent examination.

v) Upper Limbs: - Adequate arm function and grip

vi) Spine: - Adequately flexible for the job concerned.

vii) Lower Limbs: - Adequate leg and foot concerned.

viii) General: - Mental alertness and stability with good eye, hand and foot coordination.

c) Any other tests which the examining doctor considers necessary

42.1.2. If the contractor fails to get the medical examination conducted as mentioned above, the employer will have the right to get the same conducted by through an agency with intimation to the contractor and deduct the cost and overhead charges.

42.2 **Occupational Health Centre**

42.2.1 **The contractor shall ensure at a construction site an occupational health centre, mobile or static is provided and maintained in good order. Services and facilities as per the scale lay down in Schedule X of BOCWR. A construction medical officer appointed in an occupational health centre, possess the qualification as laid down in Schedule XI of BOCWR.**

42.3 **Ambulance van and room**

42.3.1 **The contractor shall ensure at a construction site of a building or other construction work that an ambulance van and room are provided at such construction site or an arrangement is made with a nearby hospital for providing such ambulance van for transportation of serious cases of accident or sickness of workers to hospital promptly and such ambulance van and room are maintained in good repair and is equipped with standard facilities specified in Schedule IV and Schedule V of BOCWR.**

42.4 First-aid boxes

42.4.1 The contractor shall ensure at a construction site one First-aid box for 100 workers provided and maintained for providing First-aid to the building workers. Every First-aid box is distinctly marked “First-aid” and is equipped with the articles specified in Schedule III of BOCWR.

42.5 HIV/ AIDS prevention and control

42.5.1 The contractor shall adopt the Employer’s Policy on “HIV / AIDS Prevention and Control for Workmen Engaged by Contractors” and the copy of the policy is given in ***Appendix No.: 4*****.**

42.5.2 The Employer will engage a professional agency for implementing the guidelines laid down in the policy and communicate to the contractor.

42.5.3 The Contractor shall extend necessary support to the appointed agency by deputing the workmen to attend the awareness creation programmes.

42.5.4 The contractor shall also extend necessary organizational support to the appointed agency for the effective implementation of the Employers’ workplace policy on HIV/AIDS for workmen of the Contractors.

42.5.5 As laid down in the policy the contractor shall identify peer educators (1 for every 100 workers) and refer them for professional training to the Employers’ appointed agency for the purpose.

42.5.6 **The peer educators on completion of the training shall serve as the focal point for any information, education and awareness campaign among the workmen throughout the contract period.**

42.5.7 The peer educators will be paid a monthly honorarium as fixed by the Employer for rendering his services in addition to his regular duty.

42.5.8 The total number of peer educators (1 for 100 workers) shall always be maintained by the contractor.

42.5.9 **In case if these peer educators leave the contractor by creating vacancy, then the contractor at his own expense train the new replacement peer educator from the Employers' appointed agency for the purpose.**

42.5.10 It is suggested to the contractor that due care should be taken to select the peer educators from among the group of workmen so that they remain with the contractor throughout the contract period.

42.6 Prevention of mosquito breeding

42.6.1 Measures shall be taken to prevent mosquito breeding at site. The measures to be taken shall include:

i) Empty cans, oil drums, packing and other receptacles, which may retain water shall be deposited at a central collection point and shall be removed from the site regularly.

ii) Still waters shall be treated at least once every week with oil in order to prevent mosquito breeding.

iii) Contractor's equipment and other items on the site, which may retain water, shall be stored, covered or treated in such a manner that water could not be retained.

iv) Water storage tanks shall be provided.

42.6.2 Posters in both Hindi and English, which draw attention to the dangers of permitting mosquito breeding, shall be displayed prominently on the site.

42.6.3 **The contractor at periodic interval shall arrange to prevent mosquito breeding by fumigation / spraying of insecticides. Most effective insecticides shall include SOLFAC WP 10 or Baytex, The Ideal Larvicide etc.**

42.7 Alcohol and drugs

42.7.1 The contractor shall ensure at all times that no employee is working under the influence of alcohol / drugs which are punishable under Govt. regulations.

42.7.2 Smoking at public worksites by any employee is also prohibited as per Govt. regulations.

43.0 Noise

43.1 The Contractor shall consider noise as an environmental constraint in his design, planning and execution of the Works and provide demonstrable evidence of the same on Employer's request. The Contractor shall, at his own expense, take all appropriate measures to ensure that work carried out by the Contractor and by his sub-Contractors, whether on or off the Site, will not cause any unnecessary or excessive noise which may disturb the occupants of any nearby dwellings, schools, hospitals, or premises with similar sensitivity to noise.

43.1.1 Without prejudice to the generality of the foregoing, noise level reduction measures shall include the following:

i) The Contractor shall ensure that all powered mechanical equipment used in the Works shall be effectively sound reduced using the most modern techniques available including but not limited to silencers and mufflers.

ii) The Contractor shall construct acoustic screens or enclosures around any parts of the Works from which excessive noise may be generated.

43.1.2 The Contractor shall ensure that noise generated by work carried out by the Contractor and his sub-Contractors during daytime and night time shall not exceed the maximum permissible noise limits, whether continuously or intermittently, as given in the project SHE Manual. The same may be varied from time to time by and at the sole discretion of the Employer, In the event of a breach of this requirement, the Contractor shall immediately re-deploy or adjust the relevant equipment or take other appropriate measures to reduce the noise levels and thereafter maintain them at levels which do not exceed the said limits. Such measures may include without limitation the temporary or permanent cessation of use of certain items of equipment.

43.1.3 The noise monitoring requirements including monitoring locations are given in the project SHE Manual. *(Noise Monitoring Deleted).*

43.2 NOISE MONITORING*(Noise Monitoring Deleted*

43.2.1 The activities which are expected to cause noise during the construction of Bangalore metro, include noise from construction equipment, construction activities such as portal construction, boring for piling, earthwork excavation, concreting, viaduct construction (including shifting of launching truss / girder) and removal of spoil and movement of construction vehicles and delivery vehicles, traveling to and from the construction and disposal sites.

43.2.2 The level of impact of these noise sources depends upon the noise characteristics of the equipment and activities involved the construction schedule, and the distance from noise sensitive receptors.

43.2.3 The Noise Monitoring and Control Plan (NMCP) in contract specific site Environmental Quality Management Plan prepared by the Contractor shall establish procedures to monitor construction noise and determine when to apply measures to control noise pollution due to construction activities at work sites.

43.2.4 The NMCP will provide site description, define acceptable noise monitoring equipment, provide siting and operating procedures for noise equipment, indicate reports and record keeping on noise monitoring data.

43.2.5 The NMCP will provide guidance for construction activity. It shall also address noise performance criteria used in the selection of construction equipment.

43.2.6 The Noise Monitoring and Control Plan shall provide for:

a) Definition of noise-sensitive uses in the zones affected by construction.

b) Calculation of future noise levels at the closest noise-sensitive receptors to the construction activity based on construction activity and ambient noise levels.

c) Evaluation and specification of the noise abatement measures that can be applied to meet the noise objectives.

d) Monitoring construction activity and providing adjustments to noise abatement controls that may be required to increase their effectiveness.

e) regular reporting

f) Requirements of NMCP:

(i) It shall specify the nighttime and daytime construction activities, monitoring locations, equipment, procedures, and schedule of measurements and reporting methods to be used.

(ii) It shall contain a scaled plan indicating monitoring locations, including measurements to be taken at construction site boundaries and at nearby residential zones.

(iii) a record of the noise characteristics of powered mechanical equipment proposed to be used during day time and night time and of proposed working methods and of potential noise level reduction measures.

(iv) Provisions for immediate notification when measured noise levels exceed allowable limits,

(v) Provide a reporting procedure whereby noise-monitoring data is furnished to the Engineer on a weekly basis.

43.2.7 In defining the requirements of the NMCP, available measures for noise control, such as, the use of equipment with special exhaust silencers or enclosures, and the construction of temporary enclosures or noise barriers around specific construction site activity areas shall be considered. It should also specify the measures to be adopted to counter the impact of noise pollution for public and workers working at site during construction.

43.2.8 If the measured noise levels exceed the noise limits, the noise levels shall be reduced by appropriate abatement measures.

43.2.9 The NMCP will be reviewed on a regular basis and updated as necessary to assure current construction activities are addressed.

43.2.10 The Engineer shall monitor Contractor’s performance of tasks specified, and will inspect necessary records, reports and procedures related to the control of noise.

43.2.11 Impact monitoring shall be carried out at noise sensitive receptor locations within 200

feet of the construction site once each week and after a change in construction activity. Construction noise measurements shall coincide with daytime and nighttime periods of maximum noise generating construction activities.

43.2.12 Noise Monitoring data will be submitted in a Noise Measurement Report Form. It will contain the type of measurement, duration of measurement, distance of monitoring from construction site, and construction equipment working during monitoring period.

43.2.13 Appropriate parameter for measuring construction noise impacts shall be the equivalent A-weighted sound pressure level (Leq) measured in decibels (dB). The two statistical sound levels L10 and L90; the level exceeded for 10 and 90 percent of the time respectively, shall also be recorded during monitoring. The L90 may be considered as the ambient level into which the L10 as average peak level intrudes. The Lmax, Leq, L10 and L90 values will be reported in the noise measurement form along with allowable noise limit. The duration of monitoring shall be for a minimum of 30 minutes.

43.2..14 In no case shall the Contractor expose the public to construction noise levels exceeding 90dBA (slow) or to impulsive noise levels with a peak sound pressure level exceeding 140dB as measured on an impulse sound level meter.

43.2..15 Limit for construction noise is based on the existing ambient noise levels in areas adjoining the construction sites.

43.2..16 The noise levels emanating from any source during construction, shall not exceed 5 dB(A) or more above existing ambient pre-construction noise levels when measured at a point outside the premises of the location of source. The same may be varied from time to time by and at the sole discretion of the Engineer.

43.2.17 Where there are no ambient noise measurements, the construction activities shall be limited to levels measured at a distance of 200 feet from the construction limits or at the nearest affected building, whichever is closer, as given in **Table-2**.

TABLE-2

ALLOWABLE CONSTRUCTION NOISE

LAND USE	**MAXIMUM NOISE LEVELS- L_{max} dB (A)**	
	Day Time	Night Time
Residential	75	65
At all Times		
Commercial		85
Industrial		90

43.2.18 At the surface of the construction site during night time hours, the Contractor shall use only equipment that operating under full load meets the noise limits specified in **Table-3**, if a sensitive receptor would be affected.

TABLE

NOISE EMISSION LIMITS FOR CONSTRUCTION EQUIPMENT USED DURING NIGHTTIME HOURS;

MEASURED AT 50 FEET FROM CONSTRUCTION EQUIPMENT*

Equipment Category	**L_{max} Level dB(A)**
Backhoe	80
Bar Bender	75
Chain Saw	81
Compactor	80
Compressor	80
Concrete Mixer	85
Concrete Pump	82
Crane	85
Dozer	85
Front End Loader	80
Generator	82
Gradall	85
Grader	85
Paver	85
Pneumatic Tools	85
Scraper	85
Tractor	84

Noise emission limits apply to equipment used at surface of the construction site during Night time hours of 9 p.m. to 6 a.m.

43.2.19 The adjustments for close in equipment noise measurement shall be made in accordance with **Table-4**.

TABLE – 4

ADJUSTMENTS FOR CLOSE-IN EQUIPMENT NOISE MEASUREMENTS

(Measurement Values to be subtracted from Measured Sound)

Distance (Feet)	Level to Estimate Sound Level at 50 Feet dB (A)
19-21	8
22-23	7
24-26	6
27-29	5
30-33	4
34-37	3
38-42	2
43-47	1
48-50	0

TABLE- 5.

CONSTRUCTION VIBRATION LIMITS

VIBRATION TYPE AND PERMISSIBLE

AGGREGATE DURATION	LIMIT
Sustained (1 hr/day)	0.01 in/sec (80 VdB re 10^{-6} in/sec)
Transient (<1 hr/day)	0.03 in/sec (90 VdB re 10^{-6} in/sec)
Transient (<10 min/day)	0.10 in/sec (100 VdB re 10^{-6} in/sec)

43.2.20 When Diesel Generator (DG) Sets are used for operation of equipment and machinery, then 'Standards and Guidelines for control of Noise Pollution from Stationery DG Sets', under Environment (Protection) Act, 1986 shall apply.

43.2..21 Should the impact monitoring record noise levels which are:-

- Indicative of a deteriorating situation such that closer monitoring is reasonably indicated, or
- When in the opinion of the Engineer additional measurements are required in view of deteriorating noise environment, then, the Engineer may require the Contractor to increase the frequency of impact monitoring at any one or more of the monitoring stations until the results indicate an improving and acceptable level of noise.

43.2..22 The Contractor shall submit a copy of monitoring results. The results should represent

a statistical evaluation of data for evaluation of trends and comparison with noise emission standards.

43.2.23 **Where the Engineer determines that the ~~recorded~~ Noise level is significantly greater than the acceptable levels, the Engineer may direct the Contractor to take effective remedial measures including, but not limited to, reviewing noise sources and modifying working procedures.**

43.2.23 The Contractor shall inform the Engineer of all steps taken to investigate cause of exceedance and immediate action taken to avoid further exceedance through written reports and proposals for action under an Event Contingency Plan.

43.3 Control Requirements

43.3.1 Construction material should be operated and transported in such a manner as not to create unnecessary noise as outlined below:

i) Perform Work within the procedures outlined herein and comply with applicable codes, regulations, and standards established by the Central and State Government and their agencies.

ii) Keep noise to the lowest reasonably practicable level. Appropriate measures will be taken to ensure that construction works will not cause any unnecessary or excessive noise, which may disturb the occupants of any nearby dwellings, schools, hospitals, or premises with similar sensitivity to noise. Use equipment with effective noise-suppression devices and employ other noise control measures as to protect the public.

iii) Schedule and conduct operations in a manner that will minimize, to the greatest extent feasible, the disturbance to the public in areas adjacent to the construction activities and to occupants of buildings in the vicinity of the construction activities.

iv) The Contractor shall submit to the Employer a Noise Monitoring and Control Plan (NMCP) under contract specific Site Environmental Plan. It shall include full and comprehensive details of all powered mechanical equipment, which he proposes to use during daytime and night - time, and of his proposed working methods and noise level reduction measures. The NMCP shall include detailed noise calculations and vibration levels to demonstrate the anticipated noise generation and vibrations by the Contractor.

v) The NMCP prepared by the Contractor shall guide the implementation of construction activity. The NMCP will be reviewed on a regular basis and updated as necessary to assure that current construction activities are addressed. It may appear as a regular agenda item in project coordination meetings, if noise is an issue at any location in the contract.

43.4 Occupational Noise

i) Protection against the effects of occupational noise exposure should be provided when the sound level exceeds the threshold values as provided in Project SHE Manual.

ii) When employees are subjected to sound levels exceeding those listed in the Table, feasible administrative or engineering controls should be utilized as given in this document and BMRCL's Project SHE Manual.

iii) If such controls fail to reduce sound levels within the levels of the table, personal protective equipment shall be provided and used to reduce sound levels within the levels of the table.

iv) When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. Exposure to different levels for various periods of time shall be computed according to the formula and sample computations, as given in project SHE Manual.

43.4 Vibration Level

43.4.1 In locations where the alignment is close to historical / heritage structures, the contractor shall prepare a monitoring scheme prior to construction at such locations. This scheme for monitoring vibration level at such historical / heritage sites shall be submitted to Employer for his approval. This scheme shall include:

i) Monitoring requirements for vibrations at regular intervals throughout the construction period.

ii) Pre-construction structural integrity inspections of historic and sensitive structures in project activity.

iii) Information dissemination about the construction method, probable effects, quality control measures and precautions to be used.

iv) The vibration level limits at work sites adjacent to the alignment shall conform to the permitted values of peak p velocity as given in article project SHE Manual.

44.0 Ventilation and illumination

44.1 Ventilation

44.1.1 The contractor shall ensure at a construction site of a building or other construction work that all working areas in a free tunnel are provided with ventilation system as approved by the DG and the fresh air supply in such tunnel is not less than $6m^3$/min for each building worker employed underground in such tunnel and the free air flow movement inside such tunnel is not less than 9m/min.

44.1.2 The oxygen level shall not be less than 19.5% in the working environment.

44.2 Illumination

44.2.1 The contractor shall take every effort to illuminate the work site as per the Employer's requirement illustrated in general instruction ***BMRC/SHE/CEO/011***.

44.2.2 **The contractor shall conduct a monthly illumination monitoring by lux meter for all the locations and the report shall be sent to the Employer within 7^{th} of the next month and the same shall be reviewed during the monthly SHE committee meeting.**

45.0 Radiation

45.1 The use of radioactive substances and radiating apparatus shall comply with the Govt. regulatory requirements and all subsidiary legislation

45.2 Operations involving ionising radiation shall only be carried out after having been reviewed without objection by the Employers representative and shall be carried out in accordance with a method statement.

45.3 Each area containing irradiated apparatus shall have warning notices and barriers, as required by the Regulations, conspicuously posted at or near the area.

45.4 Radioactive substances will be stored, used or disposed shall be strictly in accordance with the Govt. Enactments.

45.5 The contractor shall ensure that all site personnel and members of the public are not exposed to radiation.

46.0 Welfare measures for workers

46.1 Latrine and Urinal Accommodation

46.1.1 **The contractor shall provide one latrine seat for every 20 workers up to 100 workers and thereafter one for every additional 50 workers. In addition one urinal accommodation shall be provided for every 100 workers.**

46.1.2 When women are employed, separate latrine and urinals accommodation shall be provided on the same scale as mentioned above.

46.1.3 Latrine and urinals shall be provided as per Section 33 of BOCWA and maintained as per Rule 243 of BOCWR and shall also comply with the requirements of public health authorities

46.1.4 Moving sites

46.1.4.1 In case of works like track laying, the zone of work is constantly moving at elevated level or at underground level. In such cases mobile toilets with proper facility to drain the sullage shall be provided at reasonably accessible distance.

46.1.5 **In case if the contractor fail to provide required number of urinals and latrines or fail to maintain it as per the requirements of Public Health laws, the Employer shall have the right to provide/maintain through renowned external agencies like "Sulabh" at the cost of the contractor.**

46.2 **Canteen**

46.2.1 **In every workplace wherein not less than 250 workers are ordinarily employed the contractor shall provide an adequate canteen conforming to Section 37 of BOCWA, Rule 244 of BOCWR and as stipulated in Rule 247 of BOCWR the changes for food stuff shall be based on 'no profit no loss' basis. The price list of all items shall be conspicuously displayed in such canteen.**

46.3 **Serving of tea and snacks at the workplace**

46.3.1 **As per Rule 246 of BOCWR, at a building or other construction work where a workplace is situated at a distance of more than 200 m from the canteen provided under Rule 244(1) of BOCWR, the contractor employing building**

works shall make suitable arrangement for serving tea and light refreshment to such building works at such place.

46.4 **Drinking water**

46.4.1 **As per Section 32 of BOCWA the contractor shall make in every worksite, effective arrangements to provide sufficient supply of wholesome drinking water with minimum quantity of 5 litres per workman per day. Quality of the drinking water shall conform to the requirements of national standards on Public Health.**

46.4.2 While locating these drinking water facility due care shall be taken so that these are easily accessible **within a distance of 200m from the place of work** for all workers at all location of work sites.

46.4.3 All such points shall be legible marked “Drinking Water” in a language understood by a majority of the workmen employed in such place and such point shall be situated within six metres of any washing places, urinals or latrines.

46.5 **Labour Accommodation**

46.5.1 **The contractor shall provide free of charges as near as possible, temporary living accommodation to all workers conforming to provisions of Section 34 of BOCWA. These accommodations shall have cooking place, bathing, washing and lavatory facilities**

46.6 **Creches**

46.6.1 In every workplace where in more than 50 female workers are ordinarily employed, there shall be provided and maintained a suitable room for use of children under age of 6 yrs, conforming to the provisions of Section 35 of BOCWA.

PART- IV ENVIRONMENTAL MANAGEMENT

47.0 ENVIORNMENTAL MANAGEMENT

47.1 ENVIRONMENTAL MONITORING

47.1.1 The Contractor's Environmental Team shall carry out the monitoring of environmental impacts during construction. Representative sensitive receivers in the vicinity of the works shall be monitored for noise and air quality impacts.

47.1.2 For carrying out impact monitoring for noise and air, equipment shall be provided, operated and maintained by the Contractor. The equipment shall be kept in a good state of repair in accordance with the manufacturer's recommendations and maintained in proper working order with sufficient spare equipment available in the event of breakdown to maintain the planned monitoring program.

47.1.2 The calibration of monitoring instruments and their respective calibrators shall be carried out in accordance with the manufacturer's requirements to ensure they perform to the same level of accuracy as stated in the manufacturer's specifications.

47.1.3 Suspended Particulate Matter (SPM) levels shall be measured by following the standard high volume sampling method as set out in High Volume Method for Suspended Particulate, BIS: 5182-1981

47.1.4 24-hour average SPM concentration shall be measured by drawing air through a High Volume Sampler (HVS) fitted with pre-weighted Glass Fiber filter paper at an average flow rate not less than 1.1m^3 per minute.

47.1.5 The minimum requirements to the specifications of sound level meter should be as given in IS: 9779-1981. *(However Monitoring is deleted).*

47.1.6 Engineer will undertake baseline monitoring to establish background levels. Action Level of the Contractor shall be based on the results of baseline monitoring program, which will be made available to him prior to start of construction.

47.1.7 The Contractor's monitoring program is summarized in **Table –1.**

TABLE-1

SUMMARY OF CONTRACTOR'S MONITORING PROGRAMME

Parameter	Noise	Air
Sampling	Day Time (6.00 to 22.00 hrs): Lmax, Leq, L10, L90, L50 Night Time (9 PM – 6AM): Lmax, Leq, L10, L90, L50, Ld	RSPM, SPM 24-hours of the day CO: 12 hrs from 8.00 to 20.00 hrs.
Frequency At each location	Once a week (when noise ge underway).	Two 24-hour Samples every fifteen days at uniform intervals.
Locations	To be determined by the sensitive receptors.	To be determined by the Contractor based on air sensitive receptors.
Number of Locations	4 Locations	2 Locations
Duration of Monitoring by Contractor	During Civil Construction	During Civil Construction
Additional Requirements	Ad hoc monitoring as require	Ad hoc monitoring as required

47.2 EVENT CONTINGENCY PLAN

The Contractor shall prepare an Event Contingency Plan under his Site Environmental Plan. The purpose is to provide, in addition to monitoring activities, procedures for ensuring that if any environmental exceedance of limiting values (either accidental or through inadequate implementation of mitigation measures on part of the Contractor) does occur, the cause is quickly identified and remedied, and that the risk of a similar event recurring is reduced.

47.3 Air Quality

47.3.1 The Contractor shall take all necessary precautions to minimise fugitive dust emissions from operations involving excavation, grading, and clearing of land and disposal of waste. He shall not allow emissions of fugitive dust from any transport, handling, construction or storage activity to remain visible in atmosphere beyond the property line of emission source for any prolonged period of time without notification to the Employer.

47.3.2 The Contractor shall use construction equipment designed and equipped to minimise or control air pollution. He shall maintain evidence of such design and equipment and make these available for inspection by Employer.

47.3.3 If after commencement of construction activity, Employer believes that the Contractor's equipment or methods of working are causing unacceptable air

pollution impacts then these shall be inspected and remedial proposals shall be drawn up by the Contractor, submitted for review to the Employer and implemented.

47.3.4 In developing these remedial measures, the Contractor shall inspect and review all dust sources that may be contributing to air pollution. Remedial measures include use of additional / alternative equipment by the Contractor or maintenance / modification of existing equipment of the Contractor.

In the event that approved remedial measures are not being implemented and serious impacts persist, the Employer may direct the Contractor to suspend work until the measures are implemented, as required under the Contract.

47.3.5 Contractor's transport vehicles and other equipment shall conform to emission standards fixed by Statutory Agencies of Government of India or the State Government from time to time. The Contractor shall carry out periodical checks and undertake remedial measures including replacement, if required, so as to operate within permissible norms.

47.3.6 The Contractor shall establish and maintain records of routine maintenance program for internal combustion engine powered vehicles and equipment used on this project. He shall keep records available for inspection by Employer.

47.3.7 The Contractor shall cover loads of dust generating materials like debris and soil being transported from construction sites. All trucks carrying loose material should be covered and loaded with sufficient free- board to avoid spills through the tailboard or sideboards.

47.3.8 The Contractor shall promptly transport all excavation disposal materials of whatever kind so as not to delay work on the project. Stockpiling of materials will only be allowed at sites designated by the Employer. The Contractor shall place excavation materials in the dumping/disposal areas designated in the plans as given in the specifications.

47.3.9 The temporary dumping areas shall be maintained by the Contractor at all times until the excavate is re-utilised for backfilling or as directed by Employer. Dust control activities shall continue even during any work stoppage.

47.3.10 The Contractor shall place material in a manner that will minimize dust production. Material shall be minimized each day and wetted, to minimize dust production. During dry weather, dust control methods must be used daily especially on windy, dry days to prevent any dust from blowing across the site perimeter.

47.3.11 The Contractor shall water down construction sites as required to suppress dust, during handling of excavation soil or debris or during demolition. The Contractor will make water sprinklers, water supply and water delivering equipment available at any time that it is required for dust control use. Dust screens will be used, as feasible when additional dust control measures are needed specially where the work is near sensitive receptors.

47.3.12 The Contractor shall provide a wash pit or a wheel washing and/or vehicle cleaning facility at the exits from work sites such as construction depots and batching plants. At such facility, high-pressure water jets will be directed at the wheels of vehicles to remove all spoil and dirt.

47.3.13 The Contractor shall design and implement his blasting techniques so as to minimise dust, noise, vibration generation and prevention fly rock.

47.3.14 Blasting technique should be consistent not only with nature and quaintly of rock to be blasted but also the location of blasting.

47.3.15 The contractor shall give preference to explosives with better environmental characteristics.

47.3.16 The Contractor shall protect structures, utilities, pavements roads and other facilities from disfiguration and damage as a result of his activities. Where this is not possible, the contractor shall restore the structures, utilities, pavements, roads and other facilities to their original or better, failing which the rectification/restoration work shall be carried out at the risk and cost of the contractor.

47.3.17 The Contractor shall submit to the Employer an Air Monitoring and Control Plan (AMCP) under contract specific Site Environmental Plan to guide construction activity insofar as it relates to monitoring, controlling and mitigating air pollution.

47.4 AIR MONITORING

47.4.1 Construction activities that will generate dust impacts include excavation (including related activities), material handling and stockpiling, vehicular movement, and wind erosion of unpaved work areas.

47.4.2 The impact of fugitive dust on ambient air pollution depends on the quantity generated, as well as the drift potential of the dust particles injected into the atmosphere. Large dust particles will settle out near the source and smaller particles are likely to undergo dispersal over greater distance from the sources and impeded settling. SPM levels will be monitored to evaluate the dust impact during the construction phase of the Project.

47.4.3 The Air Quality Monitoring and Control Plan (AMCP) in contract-specific Site Environmental Plan prepared by the Contractor shall establish procedures to monitor impact air quality and measures to control air pollution including dust suppression due to construction activities at work sites. This plan shall contain description of activities that will cause degradation in air quality, environmental procedures to manage pollutants to minimise the air pollution, monitoring program, record keeping and reporting.

47.4.4 The Engineer shall monitor Contractor’s performance of tasks specified, and will inspect necessary records, reports and procedures related to the control of air quality given in AMCP.

47.4.5 Information gathered during the AMCP will be catalogued and maintained by the Contractor and shall be available for review by the Engineer.

47.4.6 The exact location of the air monitoring stations located near air sensitive receptors adjoining the construction sites, such as residences, schools, hotels and hospitals and placement of monitoring equipment thereat shall be agreed with the Engineer prior to commencement of air monitoring program.

47.4.7 Impact monitoring during the course of the Works shall be carried out at the monitoring stations for two days (continuous twenty-four hours) every fifteen days and where there is a perceived air quality problem.

47.4.8 The Contractor shall construct suitable fence, lockable gate, 220V AC power point and suitable access at each air monitoring station. Monitoring stations shall be free from local obstructions or sheltering.

47.4.9 Should impact monitoring record dust levels which are:

- Indicative of a deteriorating situation such that closer monitoring is reasonably indicated, or
- When in the opinion of the Engineer additional measurements are required in view of deteriorating air quality,

Then the Engineer may require the Contractor to increase the frequency of impact monitoring at any one or more of the monitoring stations until the results indicate an improving and acceptable level of air quality.

47.4.10 The Contractor shall keep records of air quality monitoring (including location, date, time). The Contractor shall submit a copy of monitoring results to the Engineer. The results should represent a statistical evaluation of data by calculating maximum, minimum, mean, standard deviation, geometric mean and percentile calculations for evaluation of frequency distribution, trends, and comparison with emission standards.

47.4.11 The National Ambient Air Quality Standards given in Air (Prevention and Control of Pollution) Act, 1981 may be referred by the Contractor for Limit Levels of SPM in ambient air which may be followed in estimating the pollution level caused by Contractor's activities.

47.4.12 Where the Engineer determines that the recorded dust (TSP) level is significantly greater than the Limit levels, the Engineer may direct the Contractor to take effective remedial measures including, but not limited to, reviewing dust sources and modifying working procedures.

47.4.13 Where the recorded baseline levels exceed the ambient air quality standards, then at such locations the action level is the recorded base line. Contractor shall take all effective remedial measures to contain the levels to their baseline value as a result of

his activities. The action level may be varied by and at the sole discretion of the Engineer.

47.4.14 The Contractor shall inform the Engineer of all steps taken to investigate cause of accidence and immediate action taken to avoid further accidence through written reports and proposals for action under an Event Contingency Plan.

48.0 Water Quality

48.1 The Contractor shall comply with the Indian Government legislation and other State regulations in existence in Bangalore insofar as they relate to water pollution control and monitoring. A drainage system should be constructed at the commencement of the Works, to drain off all surface water from the work site into suitable drain outlet.

48.2 The Contractor shall provide adequate precautions to ensure that no spoil or debris of any kind is pushed, washed, falls or deposited on land adjacent to the site perimeter including public roads or existing stream courses and drains within or adjacent to the site. In the event of any spoil or debris from construction works being deposited or any silt washed down to any area, then all such spoil, debris or material and silt shall be immediately removed and the affected land and areas restored to their natural state by the Contractor to the satisfaction of the Employer.

48.3 Due to lowering of potable water supplies in Bangalore and subsequent contamination of ground water, the Contractor is not allowed to discharge water from the site without the approval of the Employer. The Contractor must comply with the requirements of the Central Ground Water Board for discharge of water arising from dewatering. Any water obtained from dewatering systems installed in the works must be either re-used for construction purposes and this water may subsequently be discharged to the drainage system or, if not re-used, recharged to the ground water at suitable aquifer levels. The Contractor must submit his proposals for approval of Employer, on his proposed locations of dewatering of excavation and collection of water for either construction re-use or recharge directly to aquifers. The Contractor's recharge proposals must be sufficient for recharging of the quantity of water remaining after deduction of water re-used for construction. During dewatering, the contractor shall monitor ground water levels from wells to ensure that draw down levels do not exceed allowable limits. The Contractor will not be permitted to directly discharge, to the drainage system, unused ground water obtaining from the excavation without obtaining approval of Employer or the Agency controlling the system.

48.4 The Contractor shall ensure that earth, bentonite, chemicals and concrete agitator washings etc. are not deposited in the watercourses but are suitably collected and residue disposed off in a manner approved by local authorities.

48.5 All water and waste products (surface runoff and wastewater) arising on the site shall be collected and removed from the site via a suitable and properly designed temporary drainage system and disposed off at a location and in a manner that will cause neither pollution nor nuisance.

48.6 Any mud slurry from drilling, tunnelling, diaphragm wall construction or grouting etc. shall not be discharged into the drainage system unless treatment is carried out that will remove silt, mud particles, bentonite etc. The Contractor shall provide treatment facilities as necessary to prevent the discharge of contaminated ground water.

48.7 The Contractor shall discharge wastewater arising out of site office, canteen or toilet facilities constructed by him into sewers after obtaining prior approval of agency controlling the system. A wastewater drainage system shall be provided to drain wastewater into the sewerage system.

48.8 The bentonite mixing, treatment and handling system shall be established by the contractor giving due regard to its environmental impacts. The disposal of redundant bentonite shall be carefully considered whether in bulk or liquid form. The disposal location will be advised and agreed with the relevant authorities.

48.9 The Contractor shall take measures to prevent discharge of oil and grease during spillage from reaching drainage system or any water body. Oil removal / interceptors shall be provided to treat oil waste from workshop areas etc.

48.10 The Contractor shall apply to the appropriate authority for installing bore wells for water supply at site.

49.0 Archaeological and Historical Preservation

49.1 The contractor shall seek to accommodate archaeological and historical preservation concerns that may arise due to the construction of the project especially in close vicinity of such areas where such monuments may be located.

49.2 The contractor shall consult the Archaeological Survey of India (ASI) and other parties, on the advise of the Employer, to identify and assess construction effects and seek ways to avoid, minimize or mitigate adverse effects on such monuments.

49.3 Adverse effects may include reasonably foreseeable effects caused by the construction that may occur later in time, be farther removed in distance or those that alter, howsoever temporarily, the significance of the structure.

50.0 Landscape and Greenery

50.1 As far as is reasonably practicable, the Contractor shall maintain ecological balance by preventing deforestation and defacing of natural landscape. In respect of ecological balance, the Contractor shall observe the following instructions.

50.2 The Contractor shall, so conduct his construction operations, as to prevent any avoidable destruction, scarring or defacing of natural surrounding in the vicinity of work.

50.3 Where destruction, scarring, damage or defacing may occur as a result of operations relating to Permanent or Temporary works, the same shall be repaired, replanted or otherwise corrected at Contractor’s expense. All work areas shall be smoothened and graded in a manner to conform to natural appearance of the landscape as directed by the Employer.

50.4 A suggested list of trees / shrubs suitable for planting and landscaping is found in Employer’s Project SHE Manual.

51.0 Felling of Trees

51.1 The contractor shall identify the number and type of trees that are require to be felled as a result of construction of works and facilities related to Bangalore Metro Project and inform the Employer.

51.2 All trees and shrubbery, which are not specifically require to be cleared or removed for construction purposes, shall be preserved and shall be protected from any damage that may be caused by Contractor's construction operations and equipment. The contractor shall not fell, remove or dispose of any tree or forest produce in any land handed over to him for the construction of works and facilities related to Bangalore Metro except with the previous permission obtained from the Forest Department.

51.3 The Employer shall arrange permission from the forest department for trees to be felled or transplanted. The Employer will permit the removal of trees or shrubs only after prior approval.

51.4 Special care shall be exercised where trees or shrubs are exposed to injuries by construction equipment, blasting, excavating, dumping, chemical damage or other operation and the Contractor shall adequately protect such trees by used of protective barriers or other methods approved by the Employer. Trees shall not be used for anchorage.

52.0 Fly Ash

52.1 The Employer may require the contractor to use fly ash as a percentage substitution of cement, in concrete for certain structures and works.

52.2 In all such uses of Fly Ash, the contractor shall maintain a detailed record of usage of Fly Ash. The contractor shall also collect related details and provide to the Employer.

52.3 The reporting details on consumption of Fly Ash are found in Employer's SHE Manual.

53.0 Waste

53.1 The contractor is required to develop, institute and maintain a Waste Management Programme (WMP) during the construction of the project for his works, which may include: -

i) Identification of disposal sites.
ii) Identification of quantities to be excavated and disposed off.
iii) Identification of split between waste and inert material
iv) Identification of amounts intended to be stored temporarily on site location of such storage.
v) Identification of intended transport means and route.
vi) Obtaining permission, where required, for disposal.

53.2 Such a mechanism is intended to ensure that the designation of areas for the segregation and temporary storage of reusable and recyclable materials are incorporate into the WMP. The WMP should be prepared and submitted to the Engineer for approval.

53.3 The Contractor shall handle waste in a manner that ensures they are held securely without loss or leakage thus minimizing potential for pollution. The Contractor shall maintain and clean waste storage areas regularly.

53.4 The Contractor shall remove waste in a timely manner and disposed off at landfill sites after obtaining approval of the competent authorities namely BBMB, BDA, BMRDA, BWSSB.

53.5 Burning of wastes is prohibited. The Contractor shall not burn debris or vegetation or construction waste on the site but remove it in accordance with ***50.1*** above.

53.6 The Contractor shall make arrangement to dispose of metal scrap and other saleable waste to authorized dealer and make available to the Employer on request, records of such sales.

54.0 Hazardous Waste Management

54.1 If encountered or generated as a result of Contractor's activity, then waste classified as hazardous under the "Hazardous Wastes (Management & Handling) Rules, 1989, amendments 2000, 2003" shall be disposed off in a manner in compliance with the procedure given in the rules under the aforesaid act.

54.2 Chemicals classified as hazardous chemicals under "Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 of Environment (Protection) Act, 1986 shall be disposed off in a manner in compliance with the procedure given in the rules under the aforesaid act.

54.3 The contractor shall identify the nature and quantity of hazardous waste generated as a result of his activities and shall file a 'Request for Authorisation' with Delhi Pollution Control Committee along with a map showing the location of storage area.

54.4 Outside the storage area, the contractor shall place a 'display board', which will display quantity and nature of hazardous waste, on date. Hazardous Waste needs to be stored in a secure place

54.5 It shall be the responsibility of the contractor to ensure that hazardous wastes are stored, based on the composition, in a manner suitable for handling, storage and transport. The labelling and packaging is required to be easily visible and be able to withstand physical conditions and climatic factors.

54.6 The contractor shall approach only Authorised Recyclers of Hazardous Waste for disposal of Hazardous Waste, under intimation to the Employer.

54.7 Submittal of all environment related documents and records pertaining to monitoring and trend analysis on key parameters such as but not limited to consumption/efficient use of resources such as energy, water, material such as cement, fly ash, iron and steel, recycle/reuse of waste etc that shall have demonstrated continual improvement in the implementation of Environmental

management System. Failure to do so the employer shall impose appropriate penalty as indicated under penalty clause.

55.0 Energy Management

55.1 The contractor shall use and maintain equipment so as to conserve energy and shall be able to produce demonstrable evidence of the same upon Employer's request.

55.2 Measures to conserve energy include but not limited to the following:

i) Use of energy efficient motors and pumps

ii) Use of energy efficient lighting, which uses energy efficient luminaries

iii) Adequate and uniform illumination level at construction sites suitable for the task

iv) Proper size and length of cables and wires to match the rating of equipment

v) Use of energy efficient air conditioners

55.3 The contractor shall design site offices maximum daylight and minimum heat gain. The rooms shall be well insulated to enhance the efficiency of air conditioners and the use of solar films on windows may be used where feasible.

PART - V: PENALTY AND AWARDS

56.0 Charges to be recovered from contractor for unsafe act or condition

56.1 BMRCL has built an image of safety conscious organisation meticulously over a period of seven years. Any reportable accident (fatality / injury) results in loss of life and/or property damage. These accidents not only result in loss of life but also damage the reputation of BMRCL. Most of the accidents are avoidable and caused preliminary due to contractors' negligence. Hence BMRCL shall recover the cost of damages from the contractors for every reportable incident (fatality / injury).

56.2 In addition every BMRCL work site is exposed to public scrutiny as the work is executed just on the right-of-way. Any unsafe act / unsafe condition observed by public further damages our reputation. Because of the non-voluntary compliance of contractors to the condition of contract on SHE and project SHE manual, BMRCL has been forced to establish safety-enforcing organisation. The cost of established such organisation is to be recovered from contractors for all observed safety violations at sites.

56.3 The following table indicates the Safety, Health and Environment violation (unsafe act / unsafe condition) and charges to be recovered from contractors.

SL. NO	TOPIC	UNSAFE ACT/UNSAFE CONDITION	DEDUCTIBLE AMOUNT
1.	SHE Policy & Plan	i) SHE policy a) Non-compliance of clause 4.1	Rs.5,000 per single violation, compounded to a maximum of Rs.25,000 at any single instance.
		ii) SHE plan: a) Not as per Employers' content and coverage (clause 4.2, 4.7) b) Delay in submission (clause 4.2, 4.4) c) Not updated as per employer's instruction as per clause 4.4 d) Copies not provided to all required supervisors / engineers (clause 4.6)	Rs.1,00,000 per single violation, compounded to a maximum of Rs.2,00,000 at any single instance.
2.	SHE Organisation	i) Not complying to the minimum manpower requirements as mentioned in General Instruction BMRC/SHE/CEO/ 001(clause 6.1.1) ii) Not filling up the vacancies created due to SHE personnel leaving the contractor within 14 days.(clause 6.7) iii) SHE organisation not provided with required Audio-visual and other equipments as per General Instruction	i) Rs.1,00,000 per month for first month and Rs.2,00,000 for subsequent months ii) Rs.50,000 per month for first month and Rs.1,00,000 for subsequent months For items iii), iv), v) and vi)

		BMRS/SHE/CEO/012(clause 6.9.2) iv) Employing through outsourcing agencies and SHE personal are not in the payroll of the main contractor (clause 6.5.1) v) Disobedience / Improper conduct of any SHE personnel. (clause 6.2) vi) Chief SHE Manager not reporting directly to CPM of contractor. (clause 6.6)	Rs.50,000 for first violation and Rs.1,00,000 for subsequent violations
3.	SHE committee	i) Failed to formulate or conduct SHE Committee meeting for any month (clause 7.4) ii) Contractor and Sub-contractor representatives not attending SHE Committee meetings (clause 7.10) iii) Failed to conduct Site inspection before conducting SHE Committee meeting (clause 7.2.1 (viii)) iv) Failed to send SHE Committee Meeting minutes or Agenda to Employer in time (clause 7.8.1, 7.9.1) v) Non-adherence of clause 7.7.1 vi) Non-adherence of clause 7.9	i) Rs.1,00,000 for the first violation and Rs.5,00,000 for the subsequent violations ii) Rs.5,000 to the contractor of the member who had not attended the meeting for first violation and Rs.25,000 for subsequent violations. For item iii), iv), v) and vi) Rs.25,000 for first violation and Rs.50,000 for subsequent violations
4.	ID card	i) Non-adherence of clause 8.1, 8.2 and 8.3	Rs.1,00,000 for first violation and Rs.2,00,000 for subsequent violations
5.	SHE Training	i) Not complying to the requirements as mentioned in conditions of contract on SHE and project SHE manual with regard to: a) Induction training not given (clause 8.1) b) Supervisor/engineer/manager training not conducted as per clause 9.6 c) Refresher training as per clause 9.7 and 9.11 not conducted d) Tool-box talk not conducted as per clause 9.8 e) Skill development training not conducted as clause 9.9 f) Daily Safety Oath not conducted as per clause 9.10 g) Top management behaviour based SHE training conducted (clause 9.4)	For item 1 a) to g) Rs.50,000 for first violation on and Rs.1,00,000 for subsequent violations
6.	SHE Inspection	i) Not complying to the requirements as mentioned in conditions of contract on SHE and project SHE manual as per clause 10.0 ii) Non compliance of clause 10.3.6	Rs.50,000 for first violation and Rs.1,00,000 for subsequent violations

7.	SHE audit	Internal Audit: MARS i) Not conducted as per SHE Plan (clause 11.2.1) ii) Report not sent to Employer (clause 11.2.6) iii) Action not taken for any month (clause 11.2.4)	For item i) to iii) Rs.50,000 for first violation and Rs.1,00,000 for subsequent violations.
		External Audit iv) Not conducted as per SHE Plan (clause 11.4.3) v) Report not sent to employer (clause 11.4.7) vi) Action not taken for any quarter (clause 11.4.9)	For item iv) to vi) Rs.1,00,000 for first violation and Rs.2,00,000 for subsequent violations.
8.	SHE Communication	i) Important days to be observed for SHE awareness as furnished by employer not observed (clause 12.2) ii) Posters as furnished by Employer not printed and displayed (clause 12.2)	i) Rs.10,000 for first violation and Rs.50,000 for subsequent violations ii) 2,00,000 per contract
9.	SHE Submittals	i) Non compliance of clause 13.1 ii) Non compliance of clause 13.2 iii) Non compliance of clause 13.3	For item i) Rs.50,000 for first violation and Rs.1,00,000 for subsequent violations For item ii) and iii) Rs.1,00,000 for first violation and Rs.2,00,000 for subsequent violations
10.	Injury and Incidence reporting	i) Fatal accidents ii) Injury accident iii) Abnormal delay in reporting accidents or wilful suppression of information about any accidents / dangerous occurrence as per clause 14.1.4 iv) Non-compliance of the clause 14.4	i. Rs.5,00,000 for first fatality and Rs.10,00,000 for every subsequent fatality. ii. Rs.1,00,000 for first grievously injured person and Rs.2,00,000 for every subsequent grievously injured person (Grievous Injury as defined by Workmen Compensation Act) iii. Rs.1,00,000 for first violation and Rs.2,00,000 for subsequent violations For items iv) and v) Rs.50,000 for first violation and Rs.1,00,000 for subsequent violations
11.	Emergency preparedness Plan	Non-compliance of the clause 15.1,15.2, 15.3, 15.4, 15.5 and 15.6	Rs.1,00,000 for non-compliance of any of the clauses

12.	Housekeeping	i) Housekeeping maintenance register not properly maintained up to date (clause 17.4) ii) Surrounding areas of drinking water tanks / taps not hygienically cleaned / maintained (clause 17.4) iii) Office, stores, toilet / urinals not properly cleaned and maintained. (clause 17.4) iv) Required dustbins at appropriate places not provided / not cleaned. (clause 17.6) v) Stairways, gangways, passageways blocked. (clause 17.9) vi) Lumber with protruding nails left as such (clause 17.10) vii) Openings unprotected (clause 17.7) viii) Excavated earth not removed within a reasonable time. (clause 17.15) ix) Truck carrying excavated earth not covered / tyres not cleaned. (clause 17.11) x) Vehicles / equipments parked / placed on roads obstructing free flow of traffic (clause 17.13) xi) Unused surplus cables / steel scraps lying scattered (clause 17.17) xii) Wooden scraps, empty wooden cable drums lying scattered (clause 17.18) xiii) Water stagnation leading to mosquito breeding (clause 42.6.1)	Rs.10,000 per single violation Compounded to a maximum of Rs.1,00,000 at any single instance
13.	Working at Height / Ladders and Scaffolds	i) Not using or anchoring Safety Belt (clause 18.9) ii) Not using Safety Net (clause 18.18) iii) Absence of life line or anchorage point to anchor safety belt (clause 18.19) iv) Non-compliance of clause 18.17 v) Using Bamboo ladders (clause 18.20) vi) Painting of ladders vii) Improper usage (less than 1m extension above landing point, not maintaining 1:4 ratio) (clause 18.20) viii) Aluminium ladders without base rubber bush (clause 18.20) ix) Usage of broken / week ladders (clause 18.20) x) Usage of re-bar welded ladders (clause 18.20) xi) Improper guardrail, toe board, barriers and other means of collective protection (clause 18.16) xii) Improper working platform (clause 18.17) xiii) Working at unprotected fragile surface (clause 18.9) xiv) Working at unprotected edges (clause 20.0)	Rs.10,000 per single violation Compounded to a maximum of Rs.1,00,000 at any single instance

14.	Lifting appliances and gear	i) Non availability of fitness certificate as per clause 21.3 ii) Documents not displayed on the machine or not available with the operator as per clause 21.4 iii) Maximum Safe Working Load not written on the machine as per clause 21.5 iv) Non-compliance of 21.6 v) Non-compliance of 21.7 vi) Automatic safe load indicator not provided or not in working condition as per clause 21.8 vii) Age of the operator less than 21 years or without any licence and non-compliance of other item as per clause 21.9 viii) Non-compliance of 21.10 ix) Non-compliance of any of the items mentioned regarding rigging requirements as per clause 21.11 x) Failure to submit method statement in case of all critical lifting (clause 21.3) xi) Person riding on crane. (clause 23.4) xii) Creating more noise and smoke (clause 43.1.1) xiii) Absence of portable fire extinguisher in driver cabin (clause 31.5) xiv) Fail to guard hoist platform (clause 24.0) xv) No fencing of hoist rope movement area (clause 24.0) xvi) Hoist platform not in the horizontal position (clause 21.2)	Rs.50,000 per single violation Compounded to a maximum of Rs.5,00,000 at any single instance
15.	Launching operation	Non-adherence of any of the provisions mentioned in clause 22.2	Rs. 50,000 for first violation and Rs.1,00,000 for subsequent violations .
16.	Site Electrical safety	i) Non-compliance of clause 26.1.1 ii) Non-compliance of clause 26.2.3, 26.2.4 & 26.2.5 iii) Non-compliance of clause 26.3.1 iv) Non-compliance of clause 26.7, 26.8 and 26.9.1 v) Non-compliance of clause 26.10 and 26.13 vi) Non-compliance of clause 28.3.2 vii) Exposed electric lines (fermentative damage) and circuits in the workplace. (clause 26.5.1) viii) Inserting of wires directly into the socket ix) Improper grounding for the electrical appliances (clause 26.7.1) x) Electrical cables running on the ground (clause 26.8.5 & 26.8.6) xi) Non-compliance clause 27.0	Rs.10,000 per single violation Compounded to a maximum of Rs.1,00,000 at any single instance

17.	Hand tools and Power tools	i) Non-compliance of clause 28.0	Rs.10,000 per single violation Compounded to a maximum of Rs.1,00,000 at any single instance
18.	Gas Cutting	ii) Wrong colour coding of cylinder. iii) Cylinders not stored in upright position. (clause 29.1) iv) Flash back arrester, non-return valve and regulator not present or not in working condition. (clause 29.3 & 29.4) v) Fail to put cylinders in a cylinder trolley. (clause 29.1) vi) Damaged hose and fail to use hose clamps (clause 29.2) vii) Using domestic LPG cylinders (clause 29.5) viii) Fail to store cylinder 6.6m away from fire prone materials (clause 29.8) ix) Fire extinguisher not placed in the vicinity during operation (clause 29.6)	Rs.10,000 per single violation Compounded to a maximum of Rs.50,000 at any single instance
19.	Welding	i) Voltmeter and Ammeter not working (clause 29.9) ii) Non-availability of separate switch in the transformer (clause 29.9) iii) Improper grounding and return path. (clause 29.10) iv) Damaged and bare openings in the welding cable. (clause 29.10) v) Damaged holder (clause 29.10) vi) Fire extinguisher not placed in the vicinity during operation (clause 29.6)	Rs.10,000 per single violation Compounded to a maximum of Rs.50,000 at any single instance
20.	Fire precaution	i) Smoking and open flames in fire prone area (clause 31.6) ii) Using more than 24V portable electrical appliances in the fire prone area (clause 34.2.3) iii) Not proper ventilation in cylinder storage area. (clause 29.8) iv) Absence of fire extinguishers (clause 31.1) v) Fire extinguishers not refilled once in a year. (clause 31.2) vi) Fire extinguisher placed in a not easily accessible location	Rs.5,000 per single violation Compounded to a maximum of Rs.25,000 at any single instance.
21.	Excavation, Tunnelling and confined space	i) Non-compliance of clause 34.1.1 ii) Non-compliance of clause 34.2.3 iii) Non-compliance of clause 34.3	For any item from i) and ii) Rs.10,000 per single violation Compounded to a maximum of Rs.50,000 at any single instance. For item iii)

			Rs.10,000 per first violation and Rs.50,000 for subsequent violations
22.	Work permit system	i) Non-compliance of clause 35.2 ii) Non-compliance of clause 21.11.9	For item I) and ii) Rs.50,000 per first violation and Rs.1,00,000 for subsequent violations
23.	Traffic Management	i) Non-compliance of clause 36.4.1 ii) Non-compliance of clause 36.8.3 iii) Non-compliance of clause 36.9.2 iv) Non-compliance of clause 36.9.3 v) Non-compliance of clause 36.9.7 vi) Non-compliance of clause 36.9.8	Rs.1,00,000 per first violation and Rs.2,00,000 for subsequent violations
		a) Barricades (clause 36.9.4) i) Not Cleaned ii) Not in alignment iii) Not numbered iv) Not painted v) Red lights / reflectors not working vi) Damages not repaired vii) Not secured properly viii) Barricade inspector not employed ix) Protruding parts / portions repaired x) Barricades maintaining register not properly maintained up to date	Rs.25,000 per single violation Compounded to a maximum of Rs.1,00,000 at any single instance
		b) Contractor Vehicles (clause 36.9.5 & 36.9.6) i) Over loading of vehicles ii) Unfit drivers or operators iii) Unlicensed vehicles iv) Absence of traffic marshals v) Absence of reversing alarm vi) Absence of fog light (at winter) vii) Power / hand brakes not in working condition.	Rs.25,000 per single violation Compounded to a maximum of Rs.1,00,000 at any single instance
		c) Splashing of Bentonite on roads / non-cleaning of tyres of dumpers and transit mixers (clause 17.11 & 17.14) i) Mishandling of bentonite like splashing of bentonite outside specified width of barricading ii) Non-cleaning of tyres of dumpers and transit mixers before leaving the site and thereby creating a traffic safety hazard to road users.	For item i) and ii) a) Rs.1,00,000 on first observation. b) Rs. 2,00,000 on second observation c) Rs. 3,00,000 on third and subsequent observations
24.	Batching plant / Casting yard	Non-adherence of any of the provisions mentioned in clause 38.0.	Rs. 10,000 for single violation compounded to a maximum of Rs.1,00,000 at any single instant.

25.	PPE	i) Not having (clause 39.1) ii) Not wearing (or) using and kept it elsewhere (clause 39.1) iii) Using damaged one (clause 39.2) iv) Using wrong type (clause 39.5) v) Using wrong colour helmet or helmet without logo (clause 39.4.1) vi) Using for other operation (e.g. Using safety helmet for storing materials or carrying water from one place to other) (clause 39.5) vii) Not conforming to BIS standard (clause 39.2) viii) Non-compliance of clause 39.6, 39.7 and 39.8	From item i) to vi). Rs.200 per single violation For item vii) Rs.10,000 for first violation and Rs.50,000 for subsequent violations For item viii) Rs.50,000 for first violation and Rs.1,00,000 for subsequent violations
26.	Occupational Health	i) Fail to conduct Medical examination to workers (clause 42.1) ii) Absence of ambulance van & room (clause 42.3) iii) Workers not having ID card (clause 8.2) iv) Absence of first-aid person in work site. (clause 42.4) v) Absence or inadequacy of first-aid box. (clause 42.4) vi) Misuse of first-aid box. (clause 42.4) vii) First-aid box not satisfy the minimum Indian standard. (clause 42.4) viii) Smoking inside the construction site (clause 42.7.2) ix) Drink and drive or work (clause 42.7.1) x) Fumigation / insecticides not sprayed to prevent Mosquito breeding (clause 42.6.3) xi) Non-compliance of clause 44.1 and 44.2	Rs.10,000 per single violation Compounded to a maximum of Rs.1,00,000 at any single instance
27.	Labour Welfare measures	i) Inadequate number of toilets (clause 46.1.1) ii) Toilets not cleaned properly (clause 46.1.3) iii) Absence of water facilities for toilets and washing places (clause 46.1.3) iv) Toilet placed more than 500m from the work site (clause 46.1.3) v) Accommodation not provided as per BOCWA (clause 46.5.1) vi) Absence of drinking water (clause 46.4) vii) Excessive noise and vibration (clause 43.0) viii) Canteen not provided (clause 46.2) ix) Food stuff not served on no loss no profit basis (clause 46.3) x) Creche not provided (clause 46.6) xi) Non adherence of Labour welfare	Rs.10,000 per single violation Compounded to a maximum of Rs.50,000 at any single instance

		provisions of BOCWA (clause 3.3.1.2) xii) Fail to register establishment and display the registration certificate at workplace (clause 3.3.1.2) xiii) Absence of workers register and records (clause 3.3.1.2) xiv) Absence of muster roll and wages register (clause 3.3.1.2) xv) Fail to display an abstract of BOCWA and BOCWR (clause 3.3.1.2)	
28.	Environmental Management	i) Tyre wash facility not provided (clause 47.12) ii) Spillage from vehicles not arrest (clause 48.9) iii) Air monitoring not practiced (clause 47.17) iv) Noise monitoring not practiced (clause 43.2.1) v) The values of air monitoring and noise monitoring not within acceptable limits (clause 47.17, 43.2.1) vi) Dust control measures at sites not practiced (clause 47.13) vii) Improper disposal of debris / residues viii) Noncompliance of clause 53.0 & 54.0	Rs.10,000 per single violation Compounded to a maximum of Rs.50,000 at any single instance

56.4 **Without limiting to the unsafe acts and or conditions mentioned above in clause 56.3 the Employer shall have the right to deduct charges for any other unsafe act and or condition depending upon the gravity of the situation on a case-to-case basis. The charges shall be in comparison with that of the similar offence indicated in clause 56.3.**

57.0 Stoppage of work

57.1 The Employer shall have the right to stop the work at his sole discretion, if in his opinion the work is being carried out in such a way that it may cause accidents and endanger the safety of the persons and / or property, and / or equipments. In such cases, the contractor shall be informed in writing about the nature of hazards and possible injury / accident.

57.2 The contractor shall not proceed with the work until he has complied with each direction to the satisfaction of Employer

57.3 The Contractor shall not be entitled for any damages / compensation for stoppage of work, due to safety reasons and the period of such stoppage of work shall not be taken as an extension of time for Completion of the Facilities and will not be the ground for waiver of levy of liquidated damages.

58.0 Awards

The following categories will be considered for awards as per the scheme in practice of Employer

i) For every safe million man hour working without any reportable incidents

ii) Zero fatality contracts

iii) 100% adherence to voluntary reporting of all accidents throughout the currency of contract

iv) Safest project team of the year.

v) Best SHE team of the year.

vi) Safest Contractor of the year.

namma metro BMRCL	**BANGALORE METRO RAIL CORPORATION LTD.**

APPENDIX NO.: 1

Memorandum of Understanding between Bangalore Metro Rail Corporation Ltd (BMRCL) and the Contractor for safe execution of contract work

This Memorandum of Understanding is made and executed by and between Bangalore Metro Rail Corporation Ltd. (BMRCL), a Company registered under the Companies Act 1956 and having its registered office at 3rd floor, BMTC Complex, Shanthinagar, Bangalore or their authorized representative(s), hereinafter referred to as "EMPLOYER" (which expression shall wherever the context so requires or admits be deemed to mean and include its successors in business and assigns) of the one party

AND

M/s _____ having its registered office at _____ hereinafter referred to as the "CONTRACTOR" (which expression shall wherever the context so requires or admits be deemed to mean and include its successors in business and assigns) of the other party

WITNESSETH THAT

WHEREAS the EMPLOYER gives highest importance to the occupational safety, health and environment during execution of work, seeks cooperation from the CONTRACTOR in this endeavour.

Thus, this Memorandum of Understanding is for promoting the safety, health and environment aspects required to be followed at workplace/site and will be applicable to any site job to be done by the CONTRACTOR

AND

WHEREAS the CONTRACTOR has read all the terms and conditions of the EMPLOYER and whereas the CONTRACTOR has studied the following documents:

(a) Tender Documents, including Notice Inviting Tender, General Conditions, Special Conditions,
(b) Conditions of Contract on Safety, Health and Environment and Project Safety, Health and Environment Manual.
(c) Building and Other Construction Workers (Regulations of Employment and Conditions of Service) Act 1996, Central Rules 1998 and subsequent Karnataka Government Rules 2006, Building and Other Construction Workers Welfare Cess Act 1996 and Rules 1998 and notification [Central & State] Collection of cess.
(d) Indian Electricity Act 2003 and Rules 1956.
(e) Corresponding International / Bureau of Indian Standard Codes.

The amendments to any of the above rules and any other rules & regulations or procedures, circulars, notices & advices laid down by the EMPLOYER from time to time.

Now it is hereby AGREED AND DECLARED by and between the EMPLOYER and the CONTRACTOR as follows:

Clause - I	The CONTRACTOR shall abide by the terms and conditions stipulated in Condition of Contract on Safety, Health & Environment and Project Safety, Health & Environment Manual.
Clause - II	The CONTRACTOR shall undertake full responsibility for safe execution of job at work place/site and safety of his personnel and adjoining road users during work.
Clause - III	Without giving any prior notice, the EMPLOYER shall from time to time be entitled to add/or amend any or all terms and conditions with a view to improving safety and occupational health of personnel and safety of work, with immediate effect and the same shall be binding on the CONTRACTOR. The contractor agrees to implement all such amendments, which shall be laid down by the EMPLOYER.
Clause - IV	Besides following the guidelines, safety rules and regulations, safety codes given in various safety procedures/documents mentioned above, the CONTRACTOR shall also prepare detailed method statement which includes job safety analysis wherever there are complicated and hazardous/high risk working involved and get it approved from Employer before execution of work.
Clause - V	Any negligence or violation in implementing any of the provision of the conditions of contract on Safety, Health & Environment and BMRCL project Safety, Health & Environment Manual shall be viewed seriously and the contractor is liable to compensate the employer for the loss of reputation. The cost of damage shall be fixed on case-to-case basis.

In witness thereof the Parties hereto by representatives duly authorised have executed this Memorandum of Understanding on _____ day of _____ 20____.

Signed on	Signed on
For and on behalf of BMRCL	For and on behalf of (Contractor)
_____	_____
Signature:	Signature:
Name:	Name:
Title:	Title:

namma metro BMRCL	**BANGALORE METRO RAIL CORPORATION LTD.**
APPENDIX NO.: 2	

Safety, Welfare and Occupational Health requirements as per BOCW Act 1996 and Rules 1998 and BOCWKR Rules 2006.

(This list has been prepared in chronological order with primary importance to **S**ection of Act and secondary importance to **R**ules)

S - Refers relevant **S**ections in BOCWA
R - Refers relevant **R**ules in BOCWR
C - Refers relevant **C**hapter No. in BOCWR
P - Refers to relevant rules in BOCWWCR 1998
K - Refers to relevant rules in BOCWKR 2006

Sl. No.	Items	Relevant Sections / Rules in BOCWA and BOCWR and BOCWKR 2006
1.	Registration of establishment	S – 7, R – 23 to 27
2.	Display of registration certification at workplace	R – 26 (5)
3.	Hours of work	S – 28 R – 234 to 237
4.	Register of overtime	S – 28; S – 29 R – 241(1) Form XXII
5.	Weekly rest and payment at rest	R – 235
6.	Night shift	R – 236
7.	Maintenance of workers registers and records	S – 30 R – 238
8.	Notice of commencement and completion	S – 46 R – 239
9.	Register of persons employed as building workers	R – 240
10.	Muster roll and wages register	R – 241(1) (a); Form XVI and XVII
11.	Payment of wages	R – 248
12.	Display of notice of wages regarding	R – 249
13.	Register of damage or loss	R – 241(1)(a); Form XIX, XX, XXI
14.	Issue of wages book	R – 241(2)(a); Form XXIII
15.	Service certificate for each workers	R – 241(2)(b); Form XXIV
16.	Display an abstract of BOCWA and BOCWR	R – 241(5)
17.	Deduction of welfare cess by the government	P – 4(3)

	agencies	
18.	Annual return	R – 242; Form XXV
19.	Drinking water	S – 32
20.	Latrines and Urinals	S – 33 R – 243
21.	Accommodation	S – 34
22.	Creches	S – 35
23.	First-aid boxes	S – 36 R – 231 and Schedule III
24.	Canteens	S – 37 R – 244
25.	Food stuff and other items served in the canteens	R – 245
26.	Supply of tea and snacks in work place	R – 246
27.	Food charges on no loss no profit basis	R – 247
28.	BOCWKR 2006 welfare Board Rules	K – 261 to 267
29.	Safety committee	S – 38 R – 208
30.	Safety officer	S – 38 R – 209 and Schedule VII
31.	Reporting of accidents and dangerous occurrences	S – 39 R – 210
32.	Procedure for inquiry in to the causes of accidents	R – 211
33.	Responsibility of employer	S - 44 R – 5
34.	Responsibility of Architects, Project engineer and Designers	R – 6
35.	Responsibility of workmen	R – 8
36.	Responsibility for payment of wages and compensation	S – 45
37.	Penalties and Procedures	S – 47; S – 55
38.	Excessive noise, vibration etc	R – 34
39.	Fire Protection	R – 35
40.	Emergency action plan	R – 36
41.	Fencing of motors	R – 37
42.	Lifting of carrying of excessive weight	R – 38
43.	Health, Safety and Environmental Policy	R – 39
44.	Dangerous and Harmful Environment	R – 40
45.	Overhead protection	R – 41
46.	Slipping, Tripping, Cutting, Drowning and Falling Hazards	R – 42

47.	Dust, Gases, Fumes, etc	R – 43
48.	Corrosive substance	R – 49
49.	Eye Protection	R – 45
50.	Head Protection and other protection apparel	R – 46; R – 54
51.	Electrical Hazards	R – 47
52.	Vehicular traffic	R – 48
53.	Stability of structure	R – 49
54.	Illumination	R – 50; R – 124
55.	Stacking of materials	R – 51
56.	Disposal of debris	R – 52
57.	Numbering and marking of floors	R – 53
58.	Lifting appliances and gears	C – VII; R – 55 to 81
59.	Runways and Ramps	C – VIII; R – 82 to 85
60.	Working on or adjacent to water	C – IX; R – 86 & 87
61.	Transport and earthmoving equipments	C – X; R – 88 to 95
62.	Concrete work	C – XI; R – 96 to 107
63.	Demolition	C – XII; R – 108 to 118
64.	Excavation and Tunnelling works	C – XIII; R – 119 to 168
65.	Ventilation	R – 153
66.	Construction, repair and maintenance of step roof	C – XIV; R – 169 to 171
67.	Ladders and Step ladders	C – XV; R – 172 to 174
68.	Catch platform and hoardings, chutes, safety belts and nets	C – XVI; R – 175 to 180
69.	Structural frame and formworks	C – XVII; R – 181 to 185
70.	Stacking and unstacking	C – XVIII; R – 186 & 187
71.	Scaffold	C – XIX; R – 188 to 205
72.	Cofferdams and Caissons	C – XX; R – 206 to 211
73.	Explosives	C – XXI; R – 212 & 213
74.	Piling	C – XXII; R – 214 to 222
75.	Medical Examination for building and other construction worker, Crane operator an Transport vehicle drivers	R – 81; R – 223(a)(iii) and Schedule XII
76.	Medical examination for occupational health hazards	R – 223(a)(iv)
77.	Charging of workers for Medical Examination	R – 223(b)
78.	Occupational health centres and Medical officers	R – 225 and Schedule X &XI
79.	Ambulance van & room	R – 226 & 227 and Schedule IV & V
80.	Stretchers	R – 228

81.	Occupational health service for building workers	R – 229
82.	Medical examination for occupational health hazards	R – 223(a)(iv)
83.	Emergency care services and emergency treatment	R – 232
84.	Panel of experts and agencies	Central Rule 250
85.	Power of inspectors	Central rule 251 Karnataka Rules 268

namma metro BMRCL	**BANGALORE METRO RAIL CORPORATION LTD.**
APPENDIX NO.: 3	

SITE SHE PLAN

Contract No	
Contractor Name	
Project Name	

1.	**Project Highlights** i) Title of the content ii) Contractor Number iii) Brief scope of work iv) Location map/ key plan v) Period of the project
2.	**SHE Policy**
3.	**Site Organisation Chart** Chart indicating reporting of SHE personnel
4.	**Roles & Responsibility** Individual responsibility of the i) Project Manager ii) Construction Manager iii) Construction Supervisors iv) SHE Committee Members v) SHE In charge vi) Site Engineers vii) First Line Supervisors viii) Sub-contractors
5.	**SHE Committee** i) Details - Chairman, Members, Secretary and Employer's representative, ii) Procedures for effective conduct of meeting
6.	**SHE Training**
7.	**Subcontractor Evaluation, Selection and Control**
8.	**SHE Inspection**
9.	**SHE Audit**
10.	**Accident Investigation And Reporting Procedures**
11.	**Occupational Health Measures**
12.	**Labour Welfare Measures**

13.	**Risk assessment and mitigation procedures**
14.	**Safe Work Procedures** i) Work at Height ii) Structural Steel Erection iii) Launching of segments iv) Floor, Wall Openings and Stairways v) Welding, Cutting and Bracing vi) Lifting appliances vii) Work Permit Systems viii) Electrical Equipments ix) Mechanical Equipments x) Excavation xi) Fire Prevention xii) Hazardous Chemicals and Solvents xiii) Ionising Radiation xiv) Lighting xv) Abrasive Blasting
15.	**Work Permit System**
16.	**List of standard job specific PPEs to be used in the site**
17.	**Maintenance of Regime for construction Equipment and Machinery**
18.	**Traffic management**
19.	**Housekeeping**
20.	**Environmental Management**
21.	**Emergency Management**
22.	**Visitors and Security arrangement**

namma metro BMRCL	**BANGALORE METRO RAIL CORPORATION LTD.**
APPENDIX NO.: 4	

WORKPLACE POLICY ON HIV/AIDS PREVENTION & CONTROL FOR WORKMEN ENGAGED BY CONTRACTORS

"Being mobile in and of itself is not a risk factor for HIV infection. It is the situations encountered and the behaviours possibly engaged in during mobility or migration that increase vulnerability and risk regarding HIV / AIDS."

UNAIDS, Technical update on 'Population, Mobility and AIDS', February 2001, p.5

Bangalore Metro Rail Corporation (BMRCL) recognizes HIV / AIDS as a developmental challenge and realizes the need to respond to it by implementing regular HIV / AIDS prevention programmes and creating a non-discriminatory work environment for HIV infected workmen engaged by contractors. For the purpose of making conscientious, sensitive and compassionate decision in addressing the realities of HIV / AIDS, DMRC has established these guidelines based on ILO code of practice on HIV / AIDS.

- Creating awareness through professional agency using IEC (Information, Education and Communication) package specially designed for migrant workers.

- Institutional capacity building by training the project implementation team, Safety, Health & Environment (SHE) Managers, establishing linkages for efficient diagnosis and treatment of the affected workers, effective monitoring of implementation and documentation for further learning.

- Establishing peer educators by selecting them in consultation with contractors and training them through professional agencies so that they become focal point for any information, education and awareness campaigns among the workmen throughout the contract period.

- Promotion of social marketing of condoms through State Aids Control Society.

namma metro BMRCL	**BANGALORE METRO RAIL CORPORATION LTD.**
General Instruction: BMRC/SHE/CEO/001	

MINIMUM MANPOWER REQUIREMENTS OF SHE ORGANIZATION BASED ON CONTRACT VALUE

	1	2	3	4	5	6
Awarded Contract value (in Cr.)	**Chief SHE Manager**	**Senior SHE Manager**	**Junior SHE Manager**	**Safety Steward**	**Senior SHE (Electrical) Engineer**	**Junior SHE (Electrical) Engineer**
Upto 2	-	-	1	Refer Note 1	-	1
Upto 10	-	1	Refer Note 1		1	Refer Note 2
Upto 25	1	Refer Note 1			1	
Upto 100	1				1	
Upto 250	1				1	
More than 250	1				1	

	7	8	9	10	11	12	13
Awarded Contract value (in Cr.)	***Junior SHE (Fire) Manager / **Senior SHE (Fire) Manager**	**Occupational Health officer** with Necessary Nursing Assistants (Refer Note3)	**Environmental Manager**	**Senior SHE (Traffic) Engineer** (Refer Note4)	**Barricade Maintenance Squad** (Refer Note4)	**House Keeping Squad**	**Labour Welfare Officer**
Upto 2	-	-	-	-	Refer Note 5	Refer Note 6	-
Upto 10	-	1 (PT)	1	1			1
Upto 25	1*	1 (PT)	1	1			1
Upto 100	1*	1 (FT)	1	1			1
Upto 250	1**	2(FT)	1	1			1 with support staff
More than 250	2**	2(FT)	1 with support staff	1			1 with support staff

Note 1: Adequate, qualified and trained SHE Professionals with required support staff to be deployed at each worksite at each shift.

Note 2: Adequate, qualified and trained Electrical Engineers / supervisors to be deployed at each worksite at each shift.

Note 3: (PT) means Part-Time and (FT) means Full-time.

Note 4: Senior SHE (Traffic) Engineer Post and Barricade Manager (including the staff) Posts are applicable to contracts where the work has to be executed either below or over the right-of-way like Viaduct, Tunnel Contracts wherein erection and maintenance of barricades are paramount important.

Note 5: One Barricade Manager supported by required supervisors and workmen

Note 6: One Housekeeping Manager supported by required supervisors and workmen

namma metro BMRCL	**BANGALORE METRO RAIL CORPORATION LTD.**
General Instruction: BMRC/SHE/CEO/002	

MINIMUM QUALIFICATION AND EXPERIENCE FOR (SHE) SAFETY, ELECTRICAL, ENVIRONMENTAL, TRAFFIC ENGG. AND OCCUPATIONAL HEALTH PROFESSIONALS

Sl. No	Designation	Qualification	Experience (in years)
1	Chief SHE Manager	The Chief SHE Manager shall have qualified in any of the following degree/diploma: i) Post Graduate Diploma in Industrial Safety & Environmental Management (PGDISEM) from National Institute of Industrial Engineering, Mumbai ii) M.E. in Industrial Safety from NIT, Trichy, Tamil Nadu iii) M.E. in Industrial Safety from Mepco Schlenk Engineering College, Sivakasi, Tamil Nadu iv) B.E. in Fire and Safety Engg. From Cochin University of Science and Engg. Cochin, Kerala v) B.E. with advanced Safety Management Diploma from CLI / RLI Mumbai / Chennai / Kolkata and Kanpur. vi) B.E / B.Arch., with one year Full Time advanced Safety diploma from NICMAR, Hyderabad. vii) B.E / B.Tech with any other equivalent State and Central Govt. recognized full time Degree / Diploma in Safety. viii) International qualifications like CSP (Certified Safety Professional), NEBOSH, MIOSH, MSISO etc.	2 {for all category except (iv) and 5yrs for category (iv)}
2	Senior SHE Manager	As stated in Sl. No:1 and in addition the following categories: i) B.Sc.(Physics/Chemistry/Maths) with one year Full Time advanced Safety diploma from NICMAR, Hyderabad ii) B.Sc. / Diploma in Engg. with advanced Safety Management Diploma from CLI / RLI / Mumbai / Chennai / Kolkata and Kanpur. iii) B.Sc. (Physics/Chemistry/Maths) with One year Full Time diploma in Safety Engineering offered by West Bengal State Technical Education Departments and similar courses by other states. iv) Any Graduate or diploma holder with 7 years of work experience in full fledged SHE department of any Public Sector / Leading Private Sector / MNC / with prior approval of employer on a case to case basis	2 {for category (i), (ii) and (iii) only}

3	Junior SHE Manager	i) Degree in Science / Diploma in Engineering with Govt. recognized safety diplomas from Correspondence course of NICMAR, Annamalai University, National and State Productivity Councils, Other State Technical Education Boards etc. ii) Any Graduate or diploma holder with 5 years of work experience in full fledged SHE department of any Public Sector / Leading Private Sector / MNC / with prior approval of employer on a case to case basis	2 (for category (i) only)
4	Safety Steward	Any basic qualification with any SHE related certificate courses.	2
5	Senior SHE (Electrical) Manager	Degree in Electrical Engineering + Govt. recognized Electrical Licence holder	2
6	Junior SHE (Electrical) Manager	Diploma in Electrical Engineering + Govt. recognized Electrical Licence holder	1
7	Senior SHE (Fire) Manager	i) B.E. (Fire) from National Fire Service College, Nagpur ii) B.E (Fire & Safety) from Cochin University iii) Graduate with any Govt. recognized diploma in Fire Safety with 5 years of experience	2 (for category (i) and (ii) only)
8	Junior SHE (Fire) Manager	Any Diploma holder with any Govt. recognized diploma in Industrial Fire Safety.	1
9	Occupational Health Officer	MBBS with Govt. recognized degree/diploma in Industrial/ occupational health	1
10	Environment Manager	Govt. recognized PG Degree / PG Diploma / Degree in Environmental Engineering / Science	2
11	Senior SHE (Traffic) Engineer	Govt. recognized PG Degree / Degree / Diploma in Traffic/Transportation Engineering or Planning	1
12.	House Keeping Squad - Manager	Any Diploma in Engineering	1
13	Barricade Manager	Any Diploma in Engineering	1
14	Labour Welfare Officer	Any Degree with Govt. Recognized Degree / Diploma / P G Diploma in Labour Welfare related fields like Law, Personnel / Industrial Relations etc.	2

Note 1: In some extraordinary cases where the candidate had earlier worked in DMRC Projects they can be considered for the following posts:
i) Senior SHE Manager
ii) Junior SHE Manager
iii) Safety Steward
depending upon the qualification and no. of years of experience on a case-to-case basis even if they do not possess the prescribed qualification as listed above.

Note 2: In all other cases other than listed under **Note 1** irrespective their earlier experience with DMRC projects the candidates shall qualify as specified above.

namma metro BMRCL	**BANGALORE METRO RAIL CORPORATION LTD.**
General Instruction: BMRC/SHE/CEO/003	

MINIMUM REQUIREMENTS OF SHE MONITORING AND AUDIO-VISUAL EQUIPMENTS

1. For the purpose of minimum requirements of Audio-visual and Other equipment the contracts are categorized into the following groups:

Contract Value (Initial awarded value of contract)	Group
Upto 25 Cr	A
Upto 100 Cr	B
Upto 250 Cr	C
More than 250 Cr	D

2. Every contractor falling into the above groups shall provide the following minimum required audio visual aids for conducting weekly review, monthly safety committee and other post review meeting of all fatal and major incidences effectively. These audio-visual equipments are a must for conducting periodical in-house safety presentations in the training programmes.

3. In addition to the above portable hand held digital sound level meter (SLM) and portable hand held digital lux meter are also to be provided.

Sl. No	**SHE monitoring and Audio-Visual Equipment details**	**SHE monitoring and Audio-Visual equipment required for**			
		Group A Contract	**Group B Contract**	**Group C Contract**	**Group D Contract**
1.	Portable hand held Digital Sound Level Meter (SLM) *Noise Monitoring deleted*	1	1	1	1
2.	Portable hand held Digital Lux Meter	1	1	1	1
3.	Laptop Computer with standard configuration including multi media facilities	1	1	1	1
4.	Colour Printer	1	1	1	1
5.	Computer projector with screen	-	1	1	1
6.	Overhead projector	1			
7.	35mm Camera (For taking accident investigation photos in which case the images can not be easily altered)	1	1	1	1
8.	Digital camera with flash of minimum 4 mega pixel and video facility	1	1	1	2

9.	Digital still camera with flash of minimum 4 mega pixel	1	2	4	6
10.	Portable loudspeaker (for tool-box talk and emergency purpose)	1	1	2	6
11.	Communication facility like mobile phone, walky-talky etc	For all supervisors and managers/engineers working in Safety, Health & Environment			
12.	Accident investigation Kit containing the following:	1	1	1	2
a)	Chalk piece for marking				
b)	Measuring tape for measuring • Flexible tape – 2m length • Metal Foot long scale and • Metal tape – 30m				
c)	Equipment tags				
d)	Multipurpose Flash light				
e)	Barrier tape of 20m length				
f)	Accident investigation Forms and checklists				
g)	Enough Paper for witness recording and other noting				
h)	Emergency Phone Numbers list				

namma metro BMRCL	**BANGALORE METRO RAIL CORPORATION LTD.**
General Instruction: BMRC/SHE/CEO/004	

Topics for First day at work SHE orientation training of Workmen

1. Hazard Identification Procedure

Hazards on site:

- Falls
- Earthing work
- Electricity
- Machinery
- Handling materials
- Transport
- Site housekeeping
- Fire

2. Personal Protective Equipment

- What is available?
- How to obtain it?
- Correct use and care

3. Health

- Site welfare facilities
- Potential health hazards
- First Aid/CPR

4. Duties of the contractor

- Brief outline of the responsibilities of the Contractor by law
- Details of Contractor’s accident prevention policy
- DMRC’s SHE manual
- Building and other Constructions Welfare Law

5. Employee's Duties

- Brief outline of responsibilities of employee under law
- Explanation of how new employees fit into the Contractor's plan for accident prevention. (Induction and orientation).

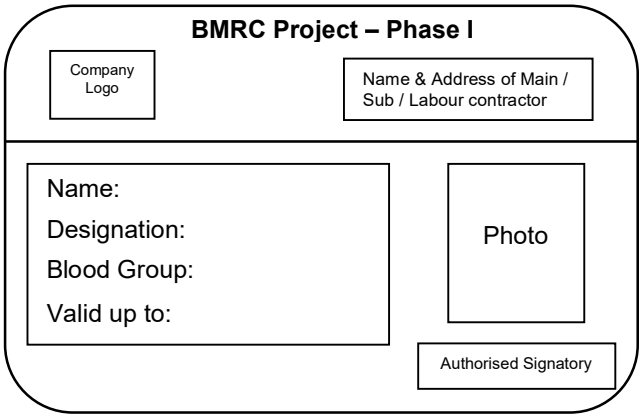
BANGALORE METRO RAIL CORPORATION LTD.

General Instruction: BMRC/SHE/CEO/005

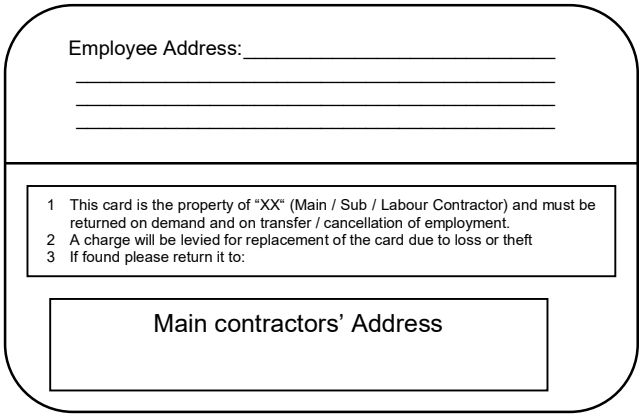
ID Card Format

(85 mm x 55mm)

Front side of ID Card:



Backside of ID Card:


Employee Address:_____
1 This card is the property of "XX" (Main / Sub / Labour Contractor) and must be returned on demand and on transfer / cancellation of employment.
2 A charge will be levied for replacement of the card due to loss or theft
3 If found please return it to:
Main contractors' Address

namma metro BMRCL	**BANGALORE METRO RAIL CORPORATION LTD.**
General Instruction: BMRC/SHE/CEO/006	

SHE Training details for Managers and Supervisors

1. The Law and Safety	**2. Policy and Administration**
Statutory requirement Appropriate regulations Duties of employer and employee	Effect of incentive on accident prevention Human relations Consultation Safety Officer: duties, aims, objectives
3. Safety and the Supervisor	**4. Principles of Accident Prevention**
Safety and efficient production go together Accidents affect morale and public relations	Attitudes of management, supervision and operations Methods of achieving safe operations Accident and injury causes
5. Site Inspection	**6. Human Behavior**
The role of management Hazard Identification Procedure Records results Follow-up procedures Feedback	Motivating agencies Individual behavior Environmental effects Techniques of persuasion
7. Site housekeeping	**8. Health**
Site organization Relationship of site housekeeping to accident occurrence Site access Equipment storage Material stacking Materials handling	Medical examination Hazard to health on site Sanitation and welfare Protective clothing First Aid/CPR
9. Personal Protective Equipment	**10. Electricity**
Eye, face, hands, feet and legs Respiratory protective equipment Protection against ionizing radiation	Appreciation of electrical hazards Power tools Arc welding Low voltage system Lighting and power system on sites ELCB, RRCB, Grounding/Ground fault circuit interrupters (GFCIs)
11. Oxygen and Acetylene Equipment	**12. Equipment**
Cylinder storage and maintenance Condition and maintenance of valves, regulators, and gauges Condition and maintenance of hoses and fittings Pressures	Accidents related to moving parts of machinery Appreciation of principles of guarding Importance of regular maintenance

13. Transportation	**14. Excavations**
Transport to and from site Hazard connected with site transport Competent drivers Dumpers Tipping trucks Movement near excavations	Method of shoring Precautions while shoring Precautions at edge of excavations Removal of shoring Sheet steel piling
15. Working platforms, Ladders, and Scaffolding	**16. Cranes and other Lifting Machines**
Hazards connected with the use of ladders Maintenance and inspection Type of scaffold Overloading Work on roofs Fragile material Openings in walls and floors Use of safety belts and nets	Licensing, certification and training required for operation of cranes Slinging methods Signaling Access to crane(s) Maintenance and examination Ground conditions Hazards and accident prevention methods connected with the use of different types of cranes/heavy equipment Crane Lift Plan for all lifts
17. Lifting Tackle	**18. Fire Prevention and Control**
Slings - single and multi-legged Safe working loads (SWLs) Safety hooks and eyebolts Cause of failure Maintenance and examination	Principle causes determining fire Understanding fire chemistry Fire fighting equipment Fire fighting training
19. Communications	**20. Manual Handling**
Effective methods of communication (particular interest to non-English speaking workers) Method and preparation of reports Safety committees Safety meeting	Body posture and procedure for lifting, pushing, pulling, dragging, sitting and walking Ergonomics Stretching exercises

BANGALORE METRO RAIL CORPORATION LTD.

General Instruction: BMRC/SHE/CEO/007

SHE Training Matrix

| Types of training | Management | | | | | | | | | | | | | | | | | | | Supervisor | | | | | | | | | | | Specific | | | | | | | | | | | | | | | | | | |

namma metro BMRCL	**BANGALORE METRO RAIL CORPORATION LTD.**
General Instruction: BMRC/SHE/CEO/008	

DAYS TO BE OBSERVED FOR CREATING SHE AWARENESS

1st Monday to Sunday of January	Road Safety Week (Subjected to confirmation from Ministry of Road Transport, Govt. of India every year.)
16th February	Kyoto Protocol Day
March	Red Cross Month
4th March	National Safety Day
7th April	World Health Day
14th April	Fire Safety Day
April 18 to 22	Earth Week
20th April	Earth Day
20th April	Noise Awareness Day
28th April	ILO World Day for Safety and Health at Work
May 1 to 7	Emergency Preparedness Week
5th June	World Environmental Day
12th June	World Day against Child Labours
9th July	Occupational Health Day
17th October	World Trauma Day
1st December	World AIDS Day

namma metro BMRCL	**BANGALORE METRO RAIL CORPORATION LTD.**
General Instruction: BMRC/SHE/CEO/009	

Minimum Requirements of SHE Communication Posters / Signages / Video

1. For the purpose of Minimum requirements of SHE Communication Posters / Signages / Video the contracts are categorized into the following groups:

Contract Value (Initial awarded value of contract)	Group
Upto 25 Cr	A
Upto 100 Cr	B
Upto 250 Cr	C
More than 250 Cr	D

2. Every contractor falling into the above groups shall prepare a SHE Communication Plan as a part of site specific SHE Plan and shall include the following minimum requirement of Posters / Signages / Video as applicable. In case readymade posters are available in any of the category from National Safety Council, Loss Prevention Association of India or any other safety related organisations they may procure the same and display it. In case the same is not available then the contractors' shall make necessary arrangements to get the posters designed and printed on their own.

   All the above are to be detailed in the Site SHE Plan and get an approval from the Employer before displaying the posters.

Table No.: 1 - Minimum No. of Posters

Sl.No	SHE Poster Title	Minimum No. of concepts in each title	No. of Posters / Signage / Video			
			Group A Contract	Group B Contract	Group C Contract	Group D Contract
1.	Safety Culture	5	Each 10	Each 50	Each 75	Each 100
2.	Daily Safety Oath	1 English &1 Hindi	Each 100	Each 200	Each 500	Each 1000
3.	Mandatory PPE Usage					
a)	**Signages** to display the messages like PPE ZONE, NO PPE ZONE, HARD HAT AREA etc.	2 types of sizes made up of **metal** sheet to be mounted at different locations	Each 25	Each 50	Each 75	Each 200

b)	Helmet	5	Each 25	Each 50	Each 75	Each 200
c)	Shoe	5	Each 25	Each 50	Each 75	Each 200
d)	Goggles & Ear Protection	5	Each 25	Each 50	Each 75	Each 200
e)	Full Body Harness	5	Each 25	Each 50	Each 75	Each 200
f)	Hi-Vi Jacket	5	Each 25	Each 50	Each 75	Each 200
4.	Emergency Management Plan	5	Each 25	Each 50	Each 75	Each 200
5.	Working at Heights	10	Each 25	Each 50	Each 75	Each 200
a)	Ladder, Stairway, Scaffold - **Signages** to display the messages like SAFE, UNSAFE, FIT FOR USE, AVOID USE etc.	5 types of sizes made up of **metal** sheet to be mounted at different locations	Each 25	Each 50	Each 75	Each 200
6.	Site Electricity	5	Each 25	Each 50	Each 75	Each 200
7.	Fire and Explosion	5	Each 25	Each 50	Each 75	Each 200
8.	Crane Safety	5	Each 25	Each 50	Each 75	Each 200
9.	Slings	5	Each 25	Each 50	Each 75	Each 200
10.	Rigging Procedures	5	Each 25	Each 50	Each 75	Each 200
11.	Excavation	5	Each 25	Each 50	Each 75	Each 200
12.	Occupational Health (Mosquito Control, HIV/AIDS awareness, Dust Control, Noise Control, No Smoking/Spitting, etc.)	10	Each 25	Each 50	Each 75	Each 200
13.	First – Aid	3	Each 25	Each 50	Each 75	Each 200
14.	Labour Welfare Measures (Payment of Minimum Wages, Avoidance of Child labour, Signing in the Muster Roll, In case of accidents-what to do? etc	5	Each 25	Each 50	Each 75	Each 200
15.	Importance of “Safety Handbook”	1	25	50	75	200
16.	Traffic Safety (Speed limit, safe crossing and working within barricaded area etc.)	5	Each 25	Each 50	Each 75	Each 200
17.	Environmental Monitoring (Spillage of Muck, hazardous material, Improper drainage, water spray for dust containment etc.)	5	Each 25	Each 50	Each 75	Each 200

18.	Video in Hindi on PPE usage – 15 minutes duration	1	-	-	-	1

Note 1: Items mentioned under 17 is **video**. Items under 3 (a) and 5 (a) are **metal signage boards** and all other items are **posters**.

Table No.: 2 – Size of Posters / Signages

Sl.No	Item	Size
1.	Posters – Standard	17”x22” –135 GSM 4 Colour Printing
2.	Posters – Special (Wherever required)	17”x22” card laminated FA Poster
3.	Posters - Mega size (Wherever required)	32”x40” Flex FA Poster
4.	First-Aid Booklet	6”x4”
5.	Safety Handbook	6”x4”
6.	Signages	Small : 12”x6” Big : 24”x12”
7.	Road Traffic Sign Boards	Strictly as per Indian Road Congress (IRC) specifications

Table No.: 3 – Safety Signage Colour (as per IS 9457)

Sl.No	Type of signage	Colour
1	Mandatory	Blue
2	Danger	Yellow
3	Prohibit	Red
4	Safe conditions	Green

namma metro BMRCL	**BANGALORE METRO RAIL CORPORATION LTD.**

General Instruction: BMRC/SHE/CEO/010

Experts / Agencies for SHE Services

Sl. No.	Organisation	Services
1.	Bureau Veritas Industrial Services (India) Pvt. Ltd., B-21 & 22, First Floor, Sector-16, NOIDA-201 301 (U.P.) Phone: 0120 - 2515055 Fax: 0120 - 2515248 E-mail: enp.delhi@in.bureauveritas.com	• External SHE Audit • SHE Management / Technical Training
2.	Central Labour Institute Post box no: 17851, N.S.Monkikar Marg Sion , Mumbai- 400 022 Tel.: 022- 4092203 Fax: 022 – 4071986 E-mail: cli@dgfasli.nic.in	• SHE Management / Technical Training
3.	Construction Industry Development Council 801, 8th Floor, Hemkunt Chambers, 89, Nehru Place, New Delhi – 110 019 E-mail: cidc@vsnl.com	• SHE Management / Technical Training
4.	Delhi Productivity Council 1E/10, Swami Ramtirath Nagar New Delhi – 110 055 Tel.: 23522835	• SHE Management / Technical Training
5.	Det Norske Veritas AS, 203, Savitri Sadan 1, 11 Preet Vihar Community Centre, New Delhi-110 092 Phone: 011-22531502/2253/1503, 22427688/22531278 Fax: 011-2253 0247 Website: www.dnv.com	• External SHE Audit • SHE Management / Technical Training
6.	Dr. A. V. Baliga Memorial trust Link House, Bagadur Shah Zafar Marg Press Area New Delhi – 110 002 Phone: 011 – 23311119	• HIV / AIDS awareness

7.	Dr. Cris Research Centre For Occupational Health & Safety 306, Guru Arjuna Dev Bhawan, Ranjit Nagar Complex, New Delhi – 110 008 Phone: 9810040406 Fax: 011 – 25702929 E-mail: team@drcris.com Website: www.drcris.com	• Ambulance Room & Van • Communication Materials • First-aid box • First-aid Training • HIV / AIDS awareness • ID Card • Medical Facilities • SHE Orientation Training
8.	DuPont Safety Resources, E.I. DuPont India Private Limited, Arihant Nitco Park 6th Floor, 90, Dr. Radhakrishnan Salai, Mylapore, Chennai-600 004 Phone: 044-2847 2800, 2847 3752 Fax: 044-2847 3800 Mobile: 9381201040 Website: in.dupont.com	• SHE Management Training
9.	EQMS INDIA PVT. LTD. 304 & 305, 3rd Floor, Rishabh Towers, Plot No. 16, Community Centre, Karkardooma, Delhi - 110092. Phone: 011 - 22374729 / 22374775 Fax: 011- 22374662 E-mail: eqms@eqmsindia.org Website: www.eqmsindia.com	• ISO Certification • SHE Management / Technical Training
10.	Green Cross Consultants 59, 7th Cross, 1st Floor, Jai Bharath Nagar, Banglore-560 033 Phone: 080-2549 6782 E-mail: etgrangan@yahoo.com	• SHE Management / Technical Training
11.	HSRTC, PENTASAFE, 201, 2nd Floor, Town Centre, Andheri Kurla Road, Marol, Andheri (East), Mumbai-400 059 Phone: 022-2850 2210/20/50 Fax: 022-2850 2260 E-mail: training@penta-safe.com	• SHE Practical Field Training for Height Safety
12.	Institute of Driving Training & Research, Wazirabad Road, Adjoining Loni Road flyover. New Delhi – 110 094 Phone: 011 – 22813474, 22815833 Fax: 011 - 22811131	• SHE Technical Training for Vehicle Drivers.

13.	Institute for Research, Development & Training of Construction Trades & Management, An Educational Institute, Society and Trust, 1st Floor, UVCE Alumni Association Building, K.R. Circle, Banglore-560 001 Phone: 080-22294291/22243257 Fax: 080-22243257 E-mail: ubrco@vsnl.com Website: www.instructindia.org	• SHE Technical /Field Training
14.	International Engineering Company K – 10, South Extension, Part – 2, New Delhi – 110 049 Phone: 011 – 26254761, 26258130 Mobile: 9312260130 E-mail: ashok@intenco.net	• Crane and Lifting appliances and Gears Certification • SHE Practical Field Training for Crane Safety
15.	L & T Eutectic 32, Sivaji Marg, New Delhi – 110 015 Phone: 011 - 51419538, 51419539 Fax: 011 - 51419600 Website: www.lnteutecticwelding.com	• SHE Practical Field Training for Welding Safety
16.	Loss Prevention Association of India Ltd. Warden House, Sir P.M. Road, Mumbai – 400 001 Website: www.lpaindia.org	• SHE Management / Technical Training
17.	MFA Crucial Moments Healthcare Pvt. Ltd., 42, Okhla Industrial Estate, Phase – II New Delhi – 110 020 Phone: 011 – 55624000 Fax: 011 – 55624010 E-mail: contact@crucialmoments.net	• First-aid Training
18.	Modicare Foundation 4 Community Centre, New Friends Colony, New Delhi – 110 065 Phone: 011 – 5167235059 Fax: 011 – 26915469 E-mail: nivedita@modi.com nivedita@gmavil.com Website: www.modicarefoundation.org	• HIV / AIDS awareness
19.	National Safety Council HQ and Institute Building 98A, Sector 15, industrial Area C.B.D Belapur, Navi Mumbai – 400614 Phone: 27579924	• SHE Management / Technical Training

20.	NICMAR (National Institute of Construction Management and Research) 910,9th Floor, Hemkunt Chambers, 89, Nehru Place, New Delhi – 110 019 Phone: 011 – 51618415, 51618417, 51618418 Fax: 011 – 51618416	• SHE Management / Technical Training
21.	Quality Growth Services Pvt. Ltd. H-13, Kirti Nagar, New Delhi – 110 015 Fax: 011 – 25431737 / 25438598 / 25918332 E-mail: qgs@qgspl.com Website: www.qgspl.com	• ISO Certification
22.	Safety Engineers Association / Safety Educational Trust – India 2/257, First Floor, Dr. Ambedkar Nagar, Manapakkam, Chennai – 600 116 Phone: 044 – 22523461 E-mail: safetrustindia@rediffmail.com	• SHE Management / Technical Training
23.	SHE Management Consultancy & Support Services, 145 A, Pocket-VI, (DDA Flats), Kondli Gharoli, Mayur Vihar-II, Delhi-110 096 Fax: 011-2262 5015 Mobile: 9811153873 E-mail: r_k_p@vsnl.net	• SHE Management / Technical Training
24.	St. Johns' Ambulance Red Cross Road New Delhi – 110 001	• First-aid Training
25.	Vexil Business Process Services Pvt. Ltd. 208, A/4, Savitri Nagar, New Delhi – 110 017 Mobile: 9350232714, 98102832201, 9350232716 E-mail: info@vexilbps.com Website: www.vexilbps.com	• Emergency Preparedness Mock drill • SHE Management / Technical Training
26.	Welding Research Institute Bharat Heavy Electricals Ltd. (BHEL) Trichirappalli, Tamil Nadu – 620 014 Phone: 0431 – 2577029, 2577283 Fax: 0431 – 2520770 E-mail: wri@bheltry.co.in	• SHE Practical Field Training for Welding Safety

BANGALORE METRO RAIL CORPORATION LTD.

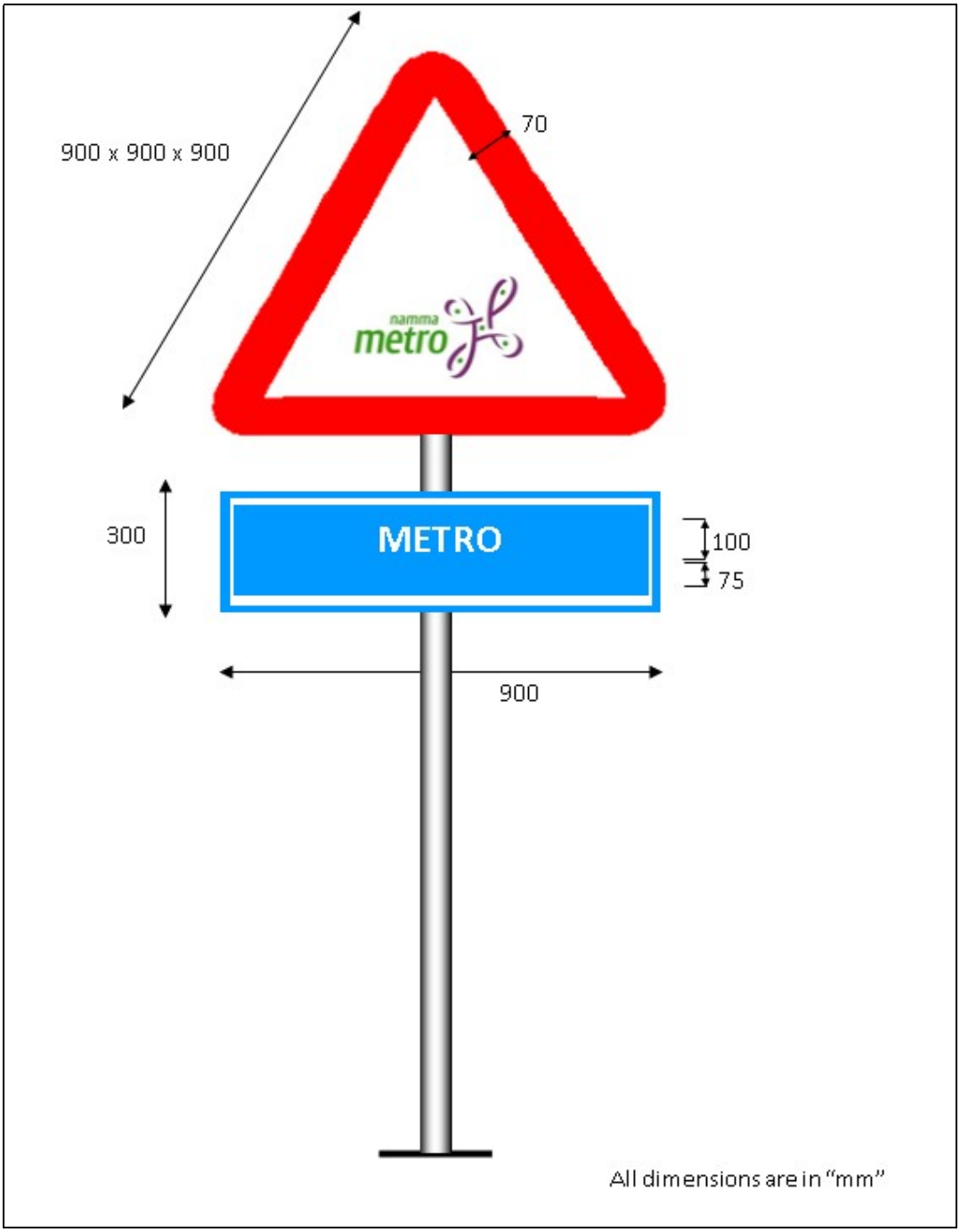
General Instruction: BMRC/SHE/CEO/011

Minimum Lighting Requirements

Sl. No.	Facility or Function	Luminance – lx (lm/ft^2)
1.	Administrative areas (offices, drafting and meeting rooms, etc.)	540 (50)
2.	**Construction areas** - general indoor - general outdoor - tunnel and general underground work areas (minimum 110 lux required at tunnel and shaft heading during drilling, mucking and scaling)	 55 (5) 33 (3) 55 (5)
3.	**Access ways** - exit ways, walkways, ladders, stairs	 110 (10)
4.	**Maintenance / Operating areas / shops** - vehicle maintenance shop - carpentry shop - outdoors field maintenance area - refuelling area, outdoors - shops, fine details work - shops, medium detail work - welding shop	 325 (30) 110 (10) 55 (5) 55 (5) 540 (50) 325 (30) 325 (30)
5.	Mechanical/electrical equipment rooms	110 (10)
6.	Hoists, Elevators, freight and passenger	215 (20)
7.	**Warehouses and storage rooms/area** - indoor stockroom, active/bulk storage - indoor rack storage - outdoor storage	 110 (10) 270 (25) 33 (3)
8.	Health Centres and First aid stations and infirmaries	325 (30)
9.	Toilets, wash and dressing rooms	110 (10)
10.	Work areas – general (not listed above)	325 (30)
11.	Parking areas	33 (3)
12.	Visitor areas	215 (20)
13.	Laboratories	540 (50)

BMRCL	**BANGALORE METRO RAIL CORPORATION LTD.**
General Instruction: BMRC/SHE/CEO/012	

Warning Traffic Sign



namma metro BMRCL	**BANGALORE METRO RAIL CORPORATION LTD.**

FORM No. : SF/001

FORMATION OF SITE SHE COMMITTEE	
Contract No	
Contractor Name	
Contract Title	

CIRCULAR

Committee

The following SHE Committee is constituted with immediate effect:

Chairman:

Members:

1)
2)
3)
4)
5)

Secretary:

Periodicity

The committee will meet at least once in a month on the day (specify date)

Agenda

Secretary will circulate agenda of the meeting at least two days in advance of the schedule date of the meeting.

Circulation

List of the meeting will be mounted in the standard format and circulated to the following under the signature of the secretary

1. Chairman
2. Members
3. BMRCL Representatives
4. Others concerned

Date: Signed By: ----------

CHAIRMAN

namma metro BMRCL	**BANGALORE METRO RAIL CORPORATION LTD.**

FORM No. : SF/002

MINUTES OF SHE COMMITTEE MEETING			
Contract No.			
Contractor Name			
Contract Title			
Meeting No.		**Date of Meeting**	
Location of Meeting			

MEMBERS PRESENT	INVITEES	MEMBERS ABSENT

REPORT SENT TO					
No. of Copies	Name / Dept.	No. of Copies	Name / Dept.	No. of Copies	Name / Dept.

Prepared by: Location: Date:

MINUTES OF SHE MEETING

Item No.	Description of Discussion	Action By	Target	Remarks
1	Complaints received from Clients and corrective and preventive action			
2	Review of MOM of previous meeting			
3	NCR's / Observation from third party			
4	First - Aid cases / Reportable accident cases			
5	Future jobs and specific requirement			
6	Status of implementation of Safety plan			
7	Sub-contractor performance			
8	Analysis of first-aid cases			
9	Need for any specific system / training / PPE's / resources			
10	Observation of SHE committee during last walk down			

Next SHE Meeting is scheduled on:

Date:	**Chief SHE Manager (Signature & Name)**
Date:	**Project Manager (Signature & Name)**